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PREFACE.

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In September 1881 the Government of India appointed a "Special Committee to inquire into the recent prevalence of cholera in certain parts of the Punjab," and did me the honour to nominate me a member and the Secretary thereof. I need not here farther refer to this Committee more than to say that I was the only medical officer attached to it, and that, in preparing "the History of Cholera in India, and especially in the Punjab, during the past few years" for its use, I had to deal with a vast amount of information regarding the disease, as recorded in a series of official annual reports from the several different provinces of British India, during a period of twenty successive years.

In coming to the work of collecting and arranging the materials that thus came before me for examination, I was already impressed with the idea, in part from previous personal observation, and in part from the results of the local investigations the Committee had just concluded, that none of the current theories of the causation and spread of cholera—such as by means of a specific poison or cholera germ, or by means of human agency through intercommunication, by contagion, foul water, &c.—were capable of at all accounting for the facts we had to deal with and explain, regarding the behaviour and nature of the disease brought to our notice in the course of the local investigations made by the Special Committee in the different parts of the province where their inquiry was conducted. This impression, under the array of evidence furnished by the records I was examining, soon became a strong conviction; whilst, at the same time, the repeated allusions to the influences of the weather met with in the records of different provinces, and the constantly recurring appearance of cholera activity and certain peculiarities of climatic condition, occurring synchronously at particular seasons of the year, greatly strengthened the notion of a fixed relation between cholera activity and special climatic conditions which previous long acquaintance with the disease had inclined me to favour. In the compilation of my history of cholera in India for the use of the Special Committee I decided, therefore, on giving as full statistics of cholera prevalence and of meteorological phenomena as were available, with the object of guiding the attention more seriously in this direction of the inquiry, and in the hope of ultimately arriving at some satisfactory elucidation of the subject with the investigation of which we were specially charged.

At the very outset of this attempt, however, I found that the statistics were lamentably deficient, and that their tabulated arrangement was far from being either convenient or accurate for purposes of comparison or for statistical application. As regards cholera, the statistics for the civil popu-

ation, whilst tabulated according to districts, deal only with the mortality rom that disease; but among the troops the returns of the incidence of holera, whilst including admissions and deaths, are tabulated according to nilitary commands, and not according to geographical divisions. Thus, for everal of the early years of the series dealt with in this history, the troops n Burma, the Andamans, and parts of the Central Provinces were provided as they still are) from the Madras army, but their medical statistics were abulated together with those of the provincial army as a whole. Simiarly in the Bombay Province, the returns of troops serving at Aden and ther extra-provincial stations are included together with those within the imits of the province. The total death-rates also are calculated on the total trength in the military commands, and not in the geographical divisions, or pon the affected groups in those divisions. Again, with the exception of hose relating to the families of the European soldiers, the cholera returns or the European and Native troops and the jail populations relate only to dult males, excepting the few females and juveniles among the last class.

As regards the meteorological records, they are so imperfect and unreiable prior to the establishment of the Meteorological Department of the Government of India in 1875 that they are, in their present form, practically useless for statistical purposes. The statistics of rainfall, however, are more complete and continuous; but, as at present tabulated in the official records, hey do not give accurate or uniform results for application to statistical purposes. For instance, the average rainfall of a district or province in any one year as at present calculated is not a true average for purposes of comparison during a series of years, because the data from which successive annual averages are derived are not of the same uniform kind in each year. This is owing to the fact that the number of registering stations in the several districts is not always the same in successive years, whilst the annual average is derived from the sum total of all the registering stations in each year; so that the annual average rainfall of any district derived from two stations in one year, from five in another, and seven, or more or less, in yet another, and so on, is not a truly comparable average, year by year, through a series of years.

Confronted at the outset with such manner of defects in the statistical materials available for examination, I decided on making an effort to reduce them to some sort of order, with the view to their utility for practical purposes of inquiry. And as the same plan has been followed in the present work, I here briefly explain the nature of the changes made in the published official returns—changes which affect, however, only the form of their tabulation, and consequently the results shown thereby, without any alteration of the figures originally recorded in each instance—as they are presented in the following pages.

In the case of the cholera statistics, I have treated the returns for the troops—both European and Native—and jail populations separately and combined together as a distinct class from those relating to the civil population. First, because these returns are more accurate and reliable, as being

under the record of qualified Government officials; and next, because (with the exception of comparatively few women and juveniles among the jail populations) they relate to the incidence of the disease, both as to admissions and deaths, among adult males only, who, as a body, are placed under special and peculiar conditions of life. For the troops, I have tabulated the statistics of numerical strength, and cholera admissions and deaths, according to the provincial areas occupied by them, or of their distribution, and, in order to show the correct death-rates from the disease, have distinguished the strengths of the affected from the unaffected groups. For the civil population, I have tabulated the registered mortality by districts, and by months in each province separately, and have furnished a table showing the divisions, districts, area, and population, together with the density of population in each district, separately for the several provinces, so as to enable the inquirer to calculate the death-rate—in comparison with and correction by that among the troops and jails, which may be taken as a not very accurate guide, but still better than none—for any particular district in any particular year of those for which the mortality is recorded in the series dealt with in this history.

In the case of the meteorological statistics, owing to the very imperfect nature of the data concerning most of the different elements, excepting the rainfall, during the period of years dealt with, I have selected the rainfall as affording the best available index to the nature and peculiarities of the climatic conditions characterising the several seasons in the successive years of the series for the several districts and provinces. But in doing so I have taken one station only in each district—usually the headquarters' station—and have given the registered rainfall monthly in that same station for each successive year throughout the series, so far as the returns are available. By this arrangement a uniform datum of average is obtained for the several districts and provinces, which allows of their being fairly contrasted together, whilst, at the same time, it affords more correct results for comparison of one year with another. The averages derived from this mode of tabulating the statistics of rainfall are shown in the tabular statements placed at the commencement of the history of cholera in each province severally. The tables of rainfall statistics themselves for the successive years of the series, together with the tables of cholera mortality registered, are given at the end of each provincial history.* They are worthy of careful study and comparison together.

So much in explanation of the statistical portion of this work. A few words of explanation are necessary regarding its historical details also. In going through the cholera sections of the Official Annual Sanitary Reports for the several provinces of British India, since their first publication in 1864 and succeeding years, I found such a vast amount of recorded circumstances and events—often evidently biassed in their relation by the preconceived views of the writer—and such a variety of opinions recorded—often at vari-

* These tabular statements I have been obliged to omit, owing to the greatly increased bulk to which they would extend this book.

ance with the arguments adduced by the writers in their support—in regard to the appearance, causes, and course of cholera in different places and on different occasions, that I was quite embarrassed in the attempt to reduce the whole to some orderly form of connected narrative. In fact, I abandoned the effort to do so as a hopeless task, and restricted my labour to a general description of the first appearance and subsequent progress of the disease in the several provinces year by year, together with a selection of such passages from the published reports as seemed to me worthy of reproduction in this history of cholera in India.

In this general description I have, as a rule, closely adhered to the main accounts in the original reports, and in my quotations and extracts therefrom have not always confined myself only to those illustrating or bearing upon the connection between cholera prevalence and climatic influences, but have also given the statements and opinions recorded by different observers holding opposite, or various, views on the subject of the causes and nature of the disease as it came under their cognisance. This was indeed necessary, because my work professes to be the history of cholera in India during the twenty years 1862 to 1881, as derived from the published official records concerning the disease during that period in the several provinces of British India, and not an express treatise in substantiation of any particular theory of those which at present engage the attention and divide the opinions of medical men. At the same time, in the endeavour to institute inquiry in that direction, I have given preference to such records as seemed best to illustrate the relation of cholera prevalence to climatic influences, coupled always, whenever available, with a description of the actual life conditions and accessory surroundings of those exposed to the action of the disease, because these seem to me to offer the most intelligible and the most reasonable means of explaining the facts of cholera with which we have to deal. And at the end of my history I have in brief and popular language explained my own views regarding the causes and nature of cholera, as these have presented themselves to my understanding from a consideration of the evidence brought together in its pages.

For the results of the whole history, descriptive and statistical, I am in no way responsible. They are what is evolved from the combined work of a great number of observers and recorders, who have successively, independently, and indeed unknown to each other, during a long series of years and in widely distant parts of the country, come, observed and recorded, and gone their several ways. Yet they all agree in producing one and the same result in respect to the connection between cholera and climatic influences produced by the nature of the rainfall. For the correct quotations and correct transcription of historical and statistical details, though in differently arranged forms as regards the latter, I am responsible, as also am I for the deductions and views I have advanced regarding the causes and nature of cholera, which are based upon the evidence afforded by the historical details and statistical facts in mutual corroboration.

For the triennial periodicity of recurring cholera epidemics in India I

am not responsible. It is no invention of my own, nor do I pretend to offer an explantion of the phenomenon as such, but it is a fact plainly declared by the statistics of the disease in all parts of the country throughout the series of twenty years dealt with in this inquiry. Similarly with regard to the relation between cholera activity and the effects of rainfall upon the soil. The constantly recurring prevalence of cholera in conjunction with rainfall after drought or with drought after rainfall—always under abnormally high seasonal temperature, and in severe epidemics usually accompanied by distress from famine or pressure from high prices of food—is no imagination of my own. It is an indubitable fact, fixed and established by the evidence of the statistics of cholera mortality and rainfall throughout all parts of India during the whole series of years for which we have the records. For my explanation, however brief and imperfect it may be, of the causes and nature of cholera in connection with the relation of the disease to the effects of rainfall upon the soil and climatic conditions, I take the responsibility, and claim for my original views on this subject a careful, calm, and unprejudiced examination, being convinced that, for the practical purposes of successfully combating the disease, they offer an intelligible and reasonable solution of the facts of cholera with which in this country we are daily confronted, and lift aside the veil of mystery which we have so long allowed to conceal the realities of the disease.

In now submitting this work to the notice of the public I have at great labour, in the midst of the current duties of my official charge as Sanitary Commissioner for the Punjab, entirely rewritten and recast the arrangement of tabular statistics, but without alteration of the historical facts and statistical details, which I compiled and tabulated for the Special Committee on cholera before alluded to. I have done so because the claims of humanity and the interests of science alike require that a subject of so great importance should be known to and discussed by the scientific world for the benefit of mankind, rather than that the results of my labours in this matter should be shelved in a government office, under an undisturbed layer of dust as food for white ants, or a prop for spiders whereon to spin their webs. At the present time more especially do I feel the necessity of publishing my views on the causes and nature of cholera, together with the materials, historical and statistical, on which they are based, because it is the fashion nowadays to neglect the physiological study of the human economy in its relation to cholera, and to divert the attention from the consideration of the true pathology and therapeutics of the disease, in the pursuit of various theories of specific germs, water contamination, contagious communication, &c., which not only fail to elucidate the etiology of cholera, but also fail altogether to explain the pathology of the disease, whilst, at the same time, nothing is done in the direction of establishing fixed principles for its therapeutic treatment. So that, whilst we, neglecting the acknowledged teachings of physiology, devote our attention to the investigation of this or that assumed or fancied cause, we leave the cholera patient to a treatment of the rankest empiricism, and with the result that the death-rate

among those professionally treated, instead of diminishing, is, if anything, higher now than it was formerly.

Now, I claim for my views on the causes and nature of cholera, however briefly and imperfectly expressed they may be, at least this much, namely, that whilst explaining intelligibly the modes of operation of the, now for the first time, ascertained nature of the concomitant climatic conditions upon the functional processes of the human body, they at the same time offer a reasonable explanation, in accord with the teachings of physiology, of the symptoms produced thereby; and, which I conceive is their greatest merit, they inculcate more rational practical measures of prevention, and more precisely sensible modes of treatment, than have hitherto been suggested by any other of the current theories about the disease.

In a descriptive and statistical history of cholera in India, such as is this work, a discussion of the pathology and therapeutics of the disease naturally finds no more than a very brief mention, far less any notice of the many and various investigations of a purely technical kind, into the morbid anatomy and microscopic appearances left by the disease, which have from time to time been undertaken during the period dealt with. The object of the work is to present to the reader, in one view, what has been recorded regarding the appearances and deportment of cholera in all parts of India during the twenty years in which systematic records were first introduced and established, and to show how far these appearances and deportments of cholera are connected with peculiarities of climate, as these are affected by the nature of the rainfall and its effects upon the soil. Such a work has never before been attempted, first, because prior to 1864 the materials were entirely non-existent (in so far, at least, as concerns cholera mortality among the general civil populations), and next, because, being scattered about in a multitude of successive official annual reports, which disappeared from notice soon after publication, the materials were not easily accessible to the non-official inquirer; whilst, among officials, nobody has ventured to think of undertaking such a task, or had the opportunity of inflicting such a labour upon himself, not even by way of a contribution to the already abundant literature on cholera. It has fallen to my lot to have had the opportunity of performing this work, and with the results shown in the following pages. A real and fixed relation between cholera and weather has long been suspected to exist, but of its nature nothing definite was known. This ignorance no longer holds, and now for the first time the nature of the relation between epidemic cholera prevalence and special climatic conditions is made clear in the pages of this history. Should a careful study and examination of the materials here presented produce a clearer apprehension of the causes and nature of cholera, and thus lead to a more scientific treatment of the disease than has up to the present obtained, then my labours will have been amply rewarded.

H. W. B.

SIMLA, *20th August* 1885.

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THE

HISTORY OF CHOLERA IN INDIA.

SECTION I.

INTRODUCTORY REMARKS.

In the year 1861 Northern India was visited by a devastating epidemic of cholera. Concomitant with it there was widespread distress from high prices of food, and in many extensive tracts severe suffering from actual famine. The disease was spread over this vast area of country during the hot and rainy months of the year—that is, from May to September—and extended into Afghanistan, where it raged virulently at Kabul in October.

Of the ravages of this epidemic among the general population there are no statistics to convey even an approximate idea. Of the incidence of the disease among the troops and the jail populations there are trustworthy records available. The European troops suffered most severely. "Altogether in the North-Western Provinces and in the Punjab there were 1929 cases of cholera, and 1230 deaths among the men, women, and children of the European troops, during the prevalence of the epidemic from June to September;" and this out of an absolute strength of 20,260. The percentage of cases to strength was 9.5, and of deaths to strength 6.1, whilst that of deaths to cases was 63.8.* As the report from which the above quotation is made states—"Nowhere did the pestilence fall upon our European soldiers with such terrible violence as at Meean Meer, the military cantonment of Lahore. Out of a force comprising 2452 men, women, and children, 880 were attacked with cholera, and 535 died in the space of little more than a month. In the records of destructive epidemics there can hardly be found a more lamentable history than this. It adds not a little to the horror of the story to know that cholera hardly existed outside the cantonments of the troops, and that, while our soldiers were dying by hundreds, the city close by, with its 90,000 people, remained almost entirely free from the disease." Next to the Meean Meer outbreak, the disease fell with most severity upon the European garrison in the military cantonment at Morar, about four miles

* Report on the Cholera Epidemic of 1861 in *Northern India*, pp. 4, 5.

from the city of Gwalior. As the report above quoted states (p. 121)—"With the single exception of Meean Meer, the mortality among the troops was greater at Morar than in any other station of Upper India." The strength of the men, women, and children of the European troops at Morar when the cholera appeared among them was 1383. The number of cases of cholera was 265, and of deaths 194. The strength of the men of the Native troops at Morar at this time was 1372. "Not a single case of cholera occurred among them" (p. 125).

In consequence of these terrible losses, the Government of India, on the 31st of August 1861, appointed a Special Commission "to investigate and report on the recent outbreak of cholera among the European troops in the several stations in the North-Western Provinces and at Meean Meer;" and in prefacing the instructions detailed for the guidance of that Special Commission, "The Governor-General in Council desires that a full and searching inquiry shall be made into the particulars of every description which can throw light on this severe and fatal attack of cholera among the European troops at so many stations, and more especially among those at Meean Meer."

On the 21st July 1862, the Special Commissioners appointed to inquire into the cholera epidemic of 1861 submitted, for the consideration of His Excellency the Governor-General in Council, their report of the investigations which, under the orders of the 31st August preceding, they were ordered to undertake. Their report comprises three sections. The first contains "a description of the special local circumstances which attended the outbreak and progress of cholera in the stations and districts which principally suffered." The second contains "an account of the general results of their investigations, with an inquiry into the causes which affected the progress and virulence of the epidemic." And the third contains "a statement of the practical measures which they recommended the Government to adopt for the prevention and mitigation of future attacks of the disease."

The practical measures on this occasion recommended to Government for adoption in view to the prevention or mitigation of future attacks of epidemic cholera were, with some modifications, approved by Government and embodied in a set of rules, which were promulgated in 1864, and are still in force for the guidance of the authorities concerned.

The Special Commissioners of 1861 entered upon their prolonged and arduous labours under very peculiar difficulties, in respect to the absence of statistical data regarding not only the progress and effects of cholera among the general population of the countries over which their inquiries extended in India, but also regarding the meteorological phenomena attendant upon manifestations of the disease. They say (p. 180 of their Report)—"Although cholera has raged in India for more than forty years, almost all our scientific knowledge of the disease is derived from European observation." And farther on, commenting on the relation between epidemics of cholera and meteorological phenomena, they say (p. 183)—"So far as our information extends, this is a branch of inquiry in which literally nothing has been accomplished; nor indeed can we find that any serious attempt has hitherto been made in India even to point out its importance. It would be difficult to find a better example of the vast practical interest of these statistics of science, the collection of which in India has hardly up to the present time been commenced. Although we can draw no conclusion regarding the actual nature of the relations that exist between meteorological

conditions and cholera, it is evident that those relations are real. When we consider the regularity with which the same phenomena constantly recur, and the excellence of the opportunities which exist for their observation, we cannot doubt that it is within the power of science to solve many problems regarding them which nothing but our deliberate neglect and ignorance have suffered to remain in mystery."

Besides the difficulties above alluded to, there was at that time no proper census of the populations of British India, nor yet was there any systematic record of mortuary statistics for the populations of the different Provincial Governments. Consequently there were no data available to illustrate the course and progress of cholera from year to year among the general population of the country, and the only materials of this nature accessible were the mortuary statistics of the European and Native troops and of the jail populations.

After the lapse of twenty years from the date of appointment of the Special Commission of 1861 above referred to, the Government of India, on the 19th of September 1881, appointed a Special Committee "to inquire into the recent prevalence of cholera in certain parts of the Punjab," and issued certain instructions for their guidance in regard to the main points deserving of special attention. These instructions, it will be noted, differed from those issued for the guidance of the Special Commission of 1861, inasmuch as they referred to "the recent prevalence of cholera in certain parts of the Punjab," and to the facts connected therewith, which may be conveniently classed under two main heads, viz., "those concerning the general population, and those concerning the troops."

As regards the general population, the following points were noted as deserving of special attention:—(*a.*) "The history of cholera in India, and especially in the Punjab during the last few years." (*b.*) "Details of its history in the Lahore and other districts to which the special inquiries of the Committee may extend, &c." (*c.*) "The circumstances connected with the rise, subsidence, and disappearance of the disease in any place, or in different parts of the same place; as also those connected with the escape or comparative exemption of other places in the neighbourhood, &c." (*d.*) "Directs inquiry as to what were the exact meteorological phenomena of the year—whether they presented any peculiarity, and whether this peculiarity appears to have had any relation to the outbreak." A similar line of investigation was directed in regard to the troops, and a few special points are noted "which deserve attention." In the last place, the Special Committee were directed "to make such recommendations as seem best to them for the prevention of the disease in future years, both among the people generally and among the troops, and for the mitigation of outbreaks when they occur."

The Special Committee thus appointed entered upon the duties they were ordered to discharge under far more advantageous circumstances in respect to statistical data than existed on the earlier occasion of a similar inquiry. In the interval of twenty years which had elapsed since the Special Commission of 1861 had investigated the subject of cholera in Northern India, many of the difficulties that beset their inquiry had been to a greater or less extent removed. In 1864 the Government of India established a Sanitary Commission in each of the Presidencies. A few years later these were replaced by a Sanitary Department in each Presidency, and the appointment of a Sanitary Commissioner in each of the Provincial Governments. About the same time the populations of the several subordinate governments were roughly censused, and a regular record was commenced of their mortuary

statistics, on a uniform system, for the principal classes of disease and other causes of death. From time to time both the census and the death statistics of the general population have been improved, and more recently their birth statistics also have been collected and tabulated on a uniform system of record. Since the establishment of the Sanitary Departments in the Presidencies and their subordinate governments, an Annual Sanitary Administration Report has been officially published for each government and province. More recently a Meteorological Department has been established with the Government of India, the sphere of its observations embracing the whole region of British India; and also a Department of Agriculture and Revenue, by which the prospects of the crops and price-currents of the principal food staples are periodically published.

Unfortunately these several departments have not come into operation simultaneously over the whole of British India, and in respect to the Meteorological Department with the Government of India, its records are available only from the year 1875. The returns and reports of these several departments, incomplete and imperfect as they yet undoubtedly are, nevertheless serve a very useful purpose in elucidating the history of cholera in India; and more particularly in reference to the long-suspected relation between cholera and atmospheric conditions, as well as in confirming the conclusion previously arrived at by the Special Commission of 1861, to the effect that the outbreak and general progress of cholera—of epidemic cholera—is quite independent of famine, although, at the same time, it is certain that the distress and privation caused by famine have the effect of greatly aggravating the mortality from cholera.

The report of the Special Committee was submitted for the consideration of His Excellency the Viceroy and Governor-General in Council on the 17th January 1883. It consisted of three sections. The first contained the record of the investigations made at the several stations visited by the Special Committee; the second contained the history of cholera in India from 1862 to 1881, prepared by Deputy Surgeon-General H. W. Bellew, C.S.I.; and the third contained a statement of the practical measures recommended by the Special Committee for the prevention or mitigation of cholera in future years.

On the 5th June following the Government of India recorded a resolution on this report, and directed that its third section "be forwarded to the Military Department for consideration of the special suggestions bearing upon the management of troops and military stations. But the Government of India in the Home Department," as the resolution continues, "is not prepared to advise any departure from the conclusion repeatedly arrived at in past years as to the practical futility of quarantine and sanitary cordons in times of epidemic prevalence of cholera, and cannot recommend any relaxation of the existing rules and orders upon this subject. As regards the civil population, the Committee are only able to suggest that the local governments should continue to carry out, as funds permit, those general measures of sanitary improvement, including especially improvements in water-supply, drainage, and conservancy of cities, stations, and villages, to which the attention of the local authorities has of late years constantly been directed."

From what has been above stated it will be observed that the main points of difference between the instructions issued by Government for the guidance of the Special Commission on Cholera in 1861 and those issued for the guidance of the Special Committee on Cholera in 1881 lay in the extended and more comprehensive inquiry intrusted to the Special Commissioners appointed

in the later year, their investigation being directed to the prevalence of cholera among the general population as well as among the troops, and the first point noted as deserving of their special attention being "The History of Cholera in India, and especially in the Punjab, during the last few years."

For the preparation of such a history there is now abundant material available, and that it should be called for at the outset of the inquiry is the proper course to ensure the utilisation to good purpose of the knowledge regarding the comportment of cholera and the manifestations of its activity which has been accumulated from all parts of the country, and recorded by independent and successive observers and writers since the period at which the Special Commission of 1861 investigated the subject. For this reason, and with a view to the fullest possible elucidation of the history of cholera in India during recent years, I decided upon including within the sphere of my investigation the whole period of twenty years which had elapsed since the Special Commission of 1861 had investigated the subject, and for the greater number of which a connected and continuous series of statistics were available. But for the satisfactory completion of such a work time and opportunity are essentially necessary, and these are elements which, from the nature of the case and the unrelieved current duties of my office, are narrowed within very restricted limits.

Besides the statistical and historical information regarding cholera which is recorded in the official Annual Sanitary Administration Reports for the several Presidencies and Provincial Governments, and from which, for the most part, this history is prepared, the last twenty years have produced a very voluminous "cholera literature" in connection with the various theories of the nature and causes of the disease, which has from time to time been put forward as explanatory of its terrifying destructiveness. To describe in detail all the theories of cholera that have been advanced, or to discuss at large the arguments by which they are severally sought to be established, though doubtless a highly interesting subject, not only on account of its purely scientific importance, but also by reason of the warmth of spirit and vigorous intolerance which has been too often displayed by the propounders and advocates of these theories, is altogether beyond the requirements of the present occasion, and indeed outside the scope of the instructions by which the Special Committee was guided in the investigation of the subject of cholera in India. Yet to omit all allusion to these theories of the nature and causes of the disease would be an unpardonable fault in any history of cholera in India. I proceed, therefore, in the briefest possible terms, to preface this history of cholera in India with a summary notice of the principal theories on the subject of the nature and causes of this appalling and mystified disease which have attracted attention in this country during recent years.

The theories of cholera which have prominently attracted attention in India during the last twenty years may be briefly enumerated as the following:—(*a.*) The blood-poison theory; (*b.*) the specific-contagion theory; (*c.*) the water-contamination by-cholera-dejecta theory; (*d.*) and the cholera-germ theory. Each of these theories requires a brief notice, inasmuch as they have one and all been put to the test, more or less severely and extensively, and have failed each and all to establish the merits claimed for them, or to explain the phenomena of the disease they profess to deal with. These unsatisfactory results are the consequences of the simple fact that these several theories contain within themselves only a part of the truth, and not the whole truth; or, in other words, they are built up upon minor truths connected with the manifestations of certain special symptoms characteristic

of a particular and critical stage of the disease, and not upon the main truths of the nature and causes of cholera in all its stages. It is the presence of such modicum of truth in these several theories which has, at the first start, gained for each in turn a certain amount of credence, and which has also, on a more intimate acquaintance with and a practical test of their doctrines, failed to convince, or even to afford satisfaction.

The Blood-Poison Theory.—This theory of cholera, propounded by Dr. G. Johnson, on the assumption that the symptoms of the disease are produced by a morbid poison, which may enter the blood either through the lungs or the intestinal canal, was at first very generally accepted as the only possible explanation of some of the most striking features in the sudden and rapid consummation of the cholera seizure in collapse, especially in those by no means infrequent instances in which collapse immediately supervenes upon seizure, with but little or no manifest affection of the intestinal canal. But the existence of such a poison not having been ascertained to be a fact, the belief in a primary blood-poison in cholera has made no advance, but tends rather to be superseded by other and more plausible explanations. Yet, if for a specific blood-poison we substitute a morbid derangement in the secretions of the great emunctory organs, or the non-elimination from the blood of the effete matters ordinarily discharged from the circulation through their secretions, and at the same time allow that the materials of such changes and the effects of such diversions from the healthy process are capable of acting upon the system, under particular conditions of atmosphere, in the manner of a poison—mild, severe, or virulent as the case may be, and as the circumstances may determine—then we have much in this theory to explain intelligibly the symptoms of cholera as they present themselves in all their variety. This will become more apparent after a study of the history of cholera recorded in the following pages, and a perusal of the deductions I have drawn therefrom.

The Cholera-Contagion Theory.— This theory assumes the existence of a specific cholera virus, and asserts the doctrine of human intercourse as the medium of its transportation and dissemination from place to place, not only within the limits of India, but also from India to other parts of the Eastern world. This theory asserts that some part of India is the native seat of the origin and the prime centre of the diffusion of cholera, and that this diffusion of cholera is effected by human agency, either in the bodies of individuals who have been exposed to the influence of the disease—whether personally affected by it or not—or in articles of their clothing or baggage or merchandise, under certain conditions of their contamination by the material of cholera discharges.

This theory was adopted by the Special Commission on Cholera of 1861. Regarding the communicability of cholera by human intercourse they wrote—"We have no hesitation in declaring our belief that, whether or not proof of this fact be complete, the evidence of its truth is so strong that it must, in the present state of our knowledge, form, to no small extent, the basis on which preventive measures must be based." Nevertheless they declared that the evidence which appears to support the belief that human intercourse had a large share in the diffusion of the late epidemic of cholera through Northern India is necessarily, in a great measure, rather presumptive than direct.

Later, again, the International Sanitary Congress held at Constantinople in 1866 accorded the full weight of their authority in support of the same theory. The Commission appointed to report to the International Sanitary

Conference on a series of questions "relative to the origin, endemicity, transmissibility, and propagation of cholera," after consideration of certain statements adduced in proof of the transmissibility of cholera, unanimously adopted the proposition in the following terms:—

"*Do not all these facts demonstrate most strongly that cholera is propagated by man, and with a greater swiftness in proportion to the greater rapidity and activity of his own emigrations? The Commission does not hesitate to reply in the affirmative.*" Regarding the propagation of cholera by importation, "*the Commission unanimously concludes that the transmissibility of Asiatic cholera is an incontestable truth, proved by facts admitting of no other interpretation.*" Regarding the importation of cholera and the agents of transmission, the Commission unanimously adopted the following conclusions:—That "*man, tainted with cholera, is by himself the principal propagating agent of the disease, and a single case of cholera may give rise to the development of an epidemic;*" that "*certain facts tend to prove that a single individual* (*and à fortiori many*) *coming from a contaminated locality, and suffering from diarrhœa, may suffice to occasion the development of an epidemic of cholera, or, in other words, that premonitory diarrhœa, as it is called, may transmit cholera;*" that "*cholera may be transmitted by articles of personal use brought from an infected locality, and especially by those made use of by cholera patients; and that it also follows from ascertained facts that the disease may be imported to a distance by the same articles shut up from contact with fresh air;*" and that "*maritime communications are, from their nature, the most dangerous; that they propagate cholera to a distance most surely, and that next to them are railways, which in a short time can carry the disease to a great distance.*"

The validity of these conclusions is not supported by our experience of the behaviour of cholera in India, and the belief in the contagion of the disease—which has never been generally held in those parts of the country in which cholera is a constant visitor—is now fast disappearing in most parts of the country. Every investigation tends to show, as Bryden writes, "that in communities which we can observe, and in which there is every opportunity of knowing the actual facts, there is little, if any, tendency of the disease which we call cholera, and which we assert primarily to show the effects on the system of an air-borne miasm, to spread from one man to another by mere contact." The experience of every day in India, as is amply illustrated in the following history of the behaviour of the disease year by year, very clearly teaches that outbreaks of cholera do not travel in all directions as human beings do. On the contrary, the manifestations of the disease show very clearly that cholera declares itself epidemically only in its own seasons and in its own definite areas of prevalence, and that it absolutely refuses to be introduced by human agency into new tracts which lie outside the natural limits of its epidemic influence, notwithstanding the fact that a person contracting cholera in an affected locality within the epidemic area may carry the disease in his body and die of it at another place beyond the limits of the epidemic influence. This point, as will be seen in the following pages, is very amply illustrated by the records of the distribution of cholera mortality from year to year in all parts of India. Every province furnishes instances of some portion or other of its territories lying outside the area of the prevailing epidemic influence, and every district epidemically affected furnishes year by year numerous instances within its own limits of persons contracting cholera in localities of its activity, and dying of the disease in other localities unaffected by the cholera influence,

and this without their spreading the disease or giving rise to any outbreak of cholera in such unaffected localities. On the other hand, in many instances it happens that the arrival of persons from a cholera-affected locality—whether themselves suffering or not—in a place previously unaffected by the disease, is simultaneous with the manifestation therein of cholera activity; this circumstance, however, can be accepted only as an accidental coincidence, since the places so affected are always found to be within the limits of the general epidemic area, and it has been in no instance proved that the persons arriving simultaneously with the appearance of cholera at such places were the first or only persons who had come there from cholera-affected localities; whereas in many instances it has been proved that persons have gone from affected to unaffected places without taking cholera with them for some weeks before the cholera influence, in its own natural course, reached such previously unaffected places.

Again, the greatly increased facilities of locomotion afforded by the extension of railway and steam communication during recent years have been attended by no appreciable change in the prevalence or distribution of cholera, whilst it is a prominent fact that railways have not, as it was feared they would do, by a single day hastened the appearance of the normal seasonal manifestations of cholera activity in localities habitually affected by the epidemic influence of the disease. Nor have they operated to introduce cholera into tracts habitually exempt from its epidemic visitations, as is remarkably illustrated in the Punjab in the case of the Lahore and Mooltan line of railway. As regards the transmission of cholera out of India by means of maritime communications, there is the patent fact that the enormously increased sea-traffic between India and the countries of Europe since the opening of the Suez Canal has been followed by no commensurate increase of epidemic cholera in those countries. In this connection it is worthy of note that, although cholera is always present in England, and prevails principally during the same seasons of the year as those in which the disease is most prevalent in India, it has not there been stirred into any unwonted activity by the constant intercommunication with this country. Yet, were cholera so contagious and so readily transmissible as is asserted by the advocates of the contagion theory, this exemption of England from frequent epidemic outbreaks of the disease could hardly have been possible. A like exemption has not been enjoyed by England in respect to small-pox, a disease concerning the contagion of which there is neither question nor doubt. Indeed, the greatly increased prevalence of this contagious disease in England and some parts of Europe since the opening of the Suez Canal has given rise to the popular notion that vaccination was losing its power as a prophylactic owing to deterioration of the vaccine virus. But, in the absence of any general epidemic prevalence of small-pox in England, the more satisfactory explanation is, that the increased prevalence there of small-pox is merely the result of a more continuous and constant importation of the contagium of that disease from a country in which its natural virulence has been but very partially mitigated by vaccination into a country which is more or less extensively and thoroughly protected by vaccination.

The pages of the following history will present many instances, very varied in kind, which afford evidence more or less strongly opposed to the notion of the propagation of cholera by contagion. Of these, one of the most commonly observed during epidemic seasons of cholera prevalence is the sudden and simultaneous seizure of several persons with the characteristic symptoms of the disease, not only in different and unconnected parts of one

and the same locality, but also in different and widely separated parts of an extensive tract or region of country. Another circumstance of the same opposing tendency which has been prominently observed in all seasons of epidemic prevalence of cholera is the marked exemption from attack by the disease of those who, from their occupations as attendants upon the sick with cholera, are brought into more than the usual amount of contact with the disease. On the other hand, as will be amply illustrated in the records of the following history, numerous instances have been observed in which several members of a household or family, or several residents of a particular street or quarter of a town, or other centre of assemblage of human beings, have been struck down by the disease as if it had spread to them by direct contact from one to the other. But on inquiry it will be found that the seizures are too rapid and too simultaneous in their occurrence to countenance the idea of their occurrence through communication of the disease by the means of contact or contagion, and that the more satisfactory explanation is that of the presence of a localised influence affecting those who are subjected to its action whilst in a condition of body predisposing them to the operation of that disease influence. In those instances—and they are not of infrequent occurrence—in which hospitals happen to be centres of the localised influence of cholera, patients under treatment for other diseases sometimes happen to be the very first affected by it, and the cholera disease may also in these instances affect the attendants employed in the place thus under the cholera influence. But if the place itself happens to be free from the presence of the epidemic cholera influence, the mere presence of cholera cases treated in it is not attended by the communication of the disease either to the other sick persons in the building or to the attendants employed about them. This is illustrated amply by the treatment of genuine cases of cholera, which have not at the time been recognised as such, in the hospital wards among other patients without the disease being communicated to them. In military hospitals and jails it is not an uncommon occurrence for cholera cases to be retained in the general wards under the name of "remittent fever" cases, whilst the other recognised cases of cholera are treated separately in special cholera hospitals. Another marked feature observed in the outbreaks of epidemic cholera is the strictly limited period during which the influence remains present in a locality in which it has manifested itself, although the period varies greatly in the different localities affected, thus indicating climatic agency as the prime cause of the influence. The statistics of cholera produced in the following history afford abundant evidence to the effect that, without the presence of the epidemic cholera influence, cholera does not prevail, and that, where the epidemic cholera influence is absent, the importation of cholera in the persons of those suffering from the disease, and dying of it, is not followed by the communication of the disease to others residing in the place into which it has been thus imported. Notwithstanding all this, there is, at the same time, abundant and very clear evidence that epidemic cholera is *infectious* as opposed to *contagious*, and that the disease depends for its manifestation upon the presence of the producing influence, just as do the allied diseases influenza and malarious fevers, intermittent and remittent, in their several varieties and forms of severity. The natures of these several varieties and forms of severity (being immediately controlled by the circumstances affecting the bodily condition of the persons subjected to the action of the special disease influence) depend for their manifestations upon the presence of their producing influence—an influence always intimately associated with season and climatic phenomena.

The Water-Contamination Theory.—This theory asserts the propagation of cholera by means of drinking-water which has been contaminated by the matter of cholera evacuations. The theory was first propounded by Dr. Snow as the result of his experience during the epidemic cholera in England in 1848, when he first suggested the idea that cholera might be spread by water as well as by air. This theory asserts the following assumptions:—That cholera depends for its production upon a specific poison which is derived from the discharges of a patient suffering from the disease; that this cholera poison is swallowed, and acts directly on the mucous membrane of the intestines; that it is at the same time multiplied in the intestinal canal, and passes out greatly increased in the discharges; and that these discharges afterwards in various ways, but chiefly by becoming mixed with the drinking-water in rivers, tanks, wells, &c., reach the intestines of other persons, and produce the like disease in them.

This theory, though long since considered untenable in England, still has many advocates, and in India is about the most popular of all the theories which have been hitherto enunciated to explain the cause of the appearance and spread of cholera. And yet is it apparently the least tenable of them all. According to Macnamara, who takes water, to the exclusion of the air, to be the sole medium of the propagation of epidemic cholera (his words are, "but an epidemic outburst of the disease can only occur through the drinking-water of the place becoming contaminated with cholera matter"), this cholera poison is a specific organic matter derived only from the discharges of a patient suffering from the disease, and is capable of producing the like disease in another only if it is swallowed in a certain stage—the vibrio stage—of its decomposition, and that if the cholera matter have passed this stage of decomposition it is harmless. Moisture and heat with alkalinity favour the process of this decomposition, which is completed in the course of two or three days. Acids destroy the poison at once, but in dry air or other dry medium the cholera poison may retain its properties for an indefinite period, till called into activity by the combined effects of moisture and heat.

In India the water of streams, of tanks, and of wells is, there is no manner of doubt, contaminated to a great extent by a variety of impurities, cholera discharges among the number, more especially wherever man is settled in large communities with a fixed residence. But this impurity of the water used for drinking purposes has not been found to produce cholera. Although it is often enough one of the most prominent of the insanitary conditions which are found to be present in places where cholera is prevalent, it is immeasurably more often found to be present in places where no cholera prevails; the two classes of places being in many instances either contiguous or in close proximity in one and the same locality, but in the majority of instances widely separated and in different localities.

The ways in which the matter of cholera evacuations may reach the waters of wells, tanks, streams, &c., of any place are many, but they can only come into operation after the disease itself is established there in its activity. The means of water contamination by cholera discharges, or the matters derived from them, which are of most general operation in this country, are the following:—(*a.*) By surface-drainage after rains washing the matter of cholera discharges which have been thrown upon the ground into neighbouring streams and tanks, and into wells which have open mouths unprotected by a parapet. (*b.*) By the wind blowing similar cholera matters which have dried upon the surface under the action of the sun, in the form of dust or impalpable powder, into the same kinds of water-supply sources,

(*c.*) By the washing of clothes which have been stained with cholera discharges in streams and tanks, and in some parts of the country by throwing the corpses of persons who have died of cholera into streams and sometimes into tanks.

So far as concerns streams, this kind of contamination cannot affect the locality where it occurs, since the current carries the matters received away to other places lower down its course. That these places situated lower down the stream do not suffer from cholera in consequence is amply illustrated in the following pages, where the records of the progress of cholera show that the disease has constantly advanced up the stream against the current in the very countries in which the throwing of cholera corpses into the rivers and the running streams is most in vogue.

So far as concerns tanks and wells which may become contaminated by the desiccated matters of cholera discharges blown into them by the action of the winds, it is impossible even to conjecture the extent or the degree to which they may be thus contaminated. But it is a well-known fact, and one that is very abundantly illustrated in the statistics of cholera recorded in the following pages, that the tanks, or the large open-mouthed irrigation-wells, as the case may be, upon which villages in many very extensive tracts of the country are solely dependent for their water-supply do not produce cholera, whether they be so contaminated or not, since in every season of epidemic cholera the vast majority of the villages in those tracts escape the disease altogether.

Notwithstanding all this, it is abundantly clear that impure drinking-water may favour the attack of cholera in the individual by injuriously affecting the standard of his general bodily health, but beyond this there is no evidence to show that impure drinking-water has anywhere in this country originated an attack of cholera, and far less developed an epidemic of the disease.

The Germ-Theory of Cholera.—This theory assumes the existence of a specific cholera germ or entity endowed with life—a living organism of the fungus kind—which being swallowed in food or water, becomes infinitely multiplied in the intestinal canal, and causes by its action the symptoms which constitute cholera. Though propounded half a century ago in Germany, this theory did not attract much general attention until its revival under independent and modified forms—first, some twenty-five years later by what is known as "the subsoil-water theory" of Professor Pettenkofer, and more recently still by "the earth-generated and air-borne theory" of Dr. Bryden.

Pettenkofer, discarding water as the ordinary source of the cholera germ, assumed its development in the soil alone—in soil possessing certain special qualities of condition, namely, a damp porous soil already impregnated with excrementitious matters—as the product of a fermentative process set up in the excrementitious matters, which, he assumes, contained the cholera germ. The result of this fermentative or putrefactive process is, among the other products of the decomposition, assumed to be a cholera miasma, which, arising out of the ground as an exhalation, becomes diffused in the atmosphere of human habitations, and affects those who are susceptible of its action with the cholera disease. Pettenkofer's theory postulates the following necessary conditions for the development of cholera:—

(*a.*) A loose porous stratum of earth permeable by air and water. (*b.*) A change in the humidity of this stratum produced by fluctuation in the level of the subsoil or underground water, the most dangerous being when the

level of the water sinks after a previous rise. (*c.*) The presence in the soil of organic, and especially excrementitious, matters. (*d.*) The presence of the germ which is the specific cause of cholera, and is brought into the soil in the alvine evacuations of those suffering from cholera, or of those who are healthy, but have come from places in which cholera prevailed. (*e.*) The presence of persons who are individually susceptible of cholera. Without the concurrence of these conditions no epidemic of cholera, Pettenkofer considers, is possible. In India, unhappily, we have repeated epidemics of cholera without, apparently, the presence of the most important of these conditions, namely, the porous soil, change in subsoil water-level, and excrementitious impregnation. Nevertheless the theory is not entirely inapplicable to certain tracts of country possessing a porous soil with a fluctuating subsoil water-level, as is very plentifully and clearly shown in the records of the following pages. But the explanation which will suggest itself after careful consideration of the facts will be very different in nature from that laid down by Professor Pettenkofer. That in such localities the appearance of cholera activity is coincident with a fall in the subsoil water-level is an undeniable fact, but the explanation of the relation between these two occurrences is a point I must leave for consideration in a later passage. It will suffice here to note that the relation is real.

Bryden's theory asserts the following assumptions :—(*a.*) That there exists a cholera germ which is endowed with a limited life period, enduring, with intervals of dormancy, during four to six successive years. (*b.*) That this cholera germ is generated in the soil of certain districts of the Bengal Province, where it has a perennial existence and is endemic. (*c.*) That from time to time it is carried out of its native home or endemic area by moist air as its vehicle into other parts of Northern India, where it has no permanent existence, but prevails as an epidemic, and finally dies out after an existence of from four to six years; the continuance of the disease in these epidemic or invaded regions being kept up by successive invasions from Bengal. (*d.*) That during its life period the cholera germ becomes dormant for a certain interval each year, and that this state of dormancy may be prolonged in certain areas, whilst in others it is succeeded by a revival in each year, such revival being for a certain number of weeks or months only at a time. (*e.*) That by observation of the natural laws which control cholera, the reproduction and decay of the object producing the disease being as truly a phenomenon of season as is the phase of vegetation of each month or series of months, it is practicable to define to a day when the disease shall become dormant and when it shall revive into activity. (*f.*) That as in certain areas cholera revives into activity each year, whilst in certain other areas it remains dormant, it is possible thus to trace parallels from the study of which we can foretell what will be the geographical distribution of an impending epidemic. (*g.*) That as these parallels occur in complete subordination to meteorological influences, epidemic cholera is never in any case spread over a definite geographical area by human intercourse, nor can the disease be carried by human agency beyond the limits of the area naturally occupied by the invasion of the cholera germ. (*h.*) That a humid atmosphere is in all cases required as the vehicle of cholera, and that the prevailing wind directs its progress. (*i.*) That, nevertheless, cases of cholera occur by transmission from those who have been subject to the choleraic influence, or from fomites impregnated with the choleraic virus, but that no aggregate of cases so originated has ever produced a provincial manifestation or territorial epidemic of cholera.

Shorn of its germ element and the hypotheses built up thereon of reproduction, invasion, dormancy, revitalisation, &c., this theory contains more of the truth of cholera than all the others preceding it put together. The records of the following history abound in evidence tending to prove that in India cholera is a phenomenon of season, controlled as regards period of appearance by geographical position, and as regards local activity by conditions of climate and soil coupled with those of the health state of the individual; that in its nature and properties cholera is strictly analogous to influenza, and also to malarious fever (intermittent and remittent), and that, like those diseases, cholera is the result of atmospheric changes acting upon the system, in a manner specially determinated in each disease, under certain conditions of its bodily health; and that cholera, like influenza and malarious fever, without being contagious, is nevertheless infectious as a subordinate contingency concurrent with the general epidemic diffusion of the disease.

Abundant evidence will be found in the statistics of cholera produced in the following pages to prove that, whilst cholera has in no instance been spread beyond the natural epidemic area of the year by means of contagion, nor even been diffused by contagion within that area, the disease has, nevertheless, in many instances been communicated to the healthy by infection; as, for instance, in those cases in which the arrival of a person suffering from cholera in a place previously unaffected by the disease has been immediately, or very shortly afterwards, followed by the seizure of some of the inhabitants. But in all such cases it must be borne in mind that the manifestation of cholera under the circumstances described may in reality be due more to the accidental coincidence in the course of the general progress of the epidemic prevalence than to the direct sequence of the assumed cause and effect. For the cases referred to are only met with within or on the borders of the recognised epidemically affected area, and are triflingly few in number compared with the instances in which persons suffering from cholera arrive in unaffected places, and even die there, without any of the inhabitants taking the disease. The conclusion naturally suggesting itself from these different facts is, that in the one instance the cholera-producing influence was present in the locality, and that the arrival of the cholera patient precipitated its activity, much in the same way as the last grain thrown into a saturated solution of any salt precipitates its immediate crystallisation; whilst that in the other instance the cholera-producing influence was either altogether absent or present in too weak a degree to be capable of manifestation in the ordinary manner. With regard to the first set of instances under consideration, it is to be noted that the first persons attacked after the arrival of the cholera patient are not always those who are in direct or immediate communication with him. On the contrary, it is as often, if not oftener, found that the first case or cases after the arrival of the cholera patient occur quite independently in a different part of the village or town to that in which the new arrival has alighted and lodged; and not infrequently the occurrence of these cases is simultaneous with, or immediately precedent or immediately subsequent to, the arrival of the cholera patient. For these reasons the spread of cholera by infection must be looked upon as a very subordinate contingency concurrent with the natural diffusion of the epidemic influence.

Such, in brief terms, are the main features of the principal theories of cholera which have attracted attention in this country. I have considered it necessary to notice them, and refer to the most prominent of the circumstances which militate against their several hypotheses, not with the ob[redacted]

of testing the validity of one theory or the other by the evidence of the records which are produced in the following history, but with the object of disabusing the mind of any preconceived bias in favour of one or other of them. For it is my desire that the subject of cholera in India should be investigated with the mind unfettered by prejudice or foregone conclusions, so that the judgment and final belief shall be formed upon the evidence presented by the statistics of the disease as they have been recorded in different parts of the country by independent and successive observers and reporters during the interval that has elapsed between the investigation into the subject made by the Special Commission of 1861 and the appointment of the Special Committee of 1881.

The interval embraces the period of twenty years from 1862 to 1881 inclusive, and, except for the first four or five years of the series, affords a regular yearly succession of statistical records of cholera among the general population in the greater portion of the territories of British India. The history now produced is a plain statement of the statistical facts recorded of cholera, as derived from the published official Annual Reports of the Sanitary Departments of the several Presidencies and Provincial Governments, together with the explanatory remarks and the relation of such recorded circumstances connected with the disease as have seemed useful illustrations of its distinctive features and characteristics, so far as they have been described by different observers in widely distant parts of the country.

In my treatment of this subject my sole object and aim has been to arrive at the truth of cholera, and to represent the truth in regard to cholera, so far as is within my power; for to a serious and observant mind—a mind unbiassed by prejudice and unswayed by preconceived notions, but simply desirous of knowing the truth—a plain statement of what has been recorded during a series of successive years by independent and wholly unconnected agencies in different parts of British India is more calculated to convince than any amount of special pleading, of vigorous advocacy, or of audacious assertion. Impressed with this belief, I would wish to dismiss from the mind all previous reports and fancies, and to be guided solely by the evidence of the records which the past twenty years have year by year produced and accumulated. But I cannot conceal from myself the conviction that, as difference of character and perceptive faculty produces difference of opinion, so there will ever be, even among those who hold similar views in regard to the fundamental truths of the nature of cholera, a diversity of thought in respect to the causes which call the disease into activity or keep it back in a state of inertia. Yet this need not necessarily divert attention wholly from the actually manifested behaviour of the disease and the proper means of treating it curatively. Aware as I am of the normal state of things which leads to diversity of thought and conflict of deductions from the same series of facts, instead of dogmatically laying down my opinion and opposing the opinions of others who hold different views, I consider it my duty, whilst advocating my own line of thought, to bear and forbear with those who differ, being perfectly assured that truth or fact is incontrovertible, though it may not always prevail, whilst opinion may prevail and will certainly vary.

It is in this frame of mind that I would wish to approach the very seriously important and deeply interesting subject of cholera in India, earnestly desiring to be preserved from error, and seeking, while increasing in knowledge, to have that knowledge founded upon fact, and not upon [redacted] or baseless assertion.

The first desideratum in entering upon the history of cholera in India is a clear definition of what is meant to be understood by the term Cholera. But this is a point upon which there is much divergence, if not actual conflict, of opinion, and it will be more convenient, therefore, to leave the settlement of the question, "What is cholera?" for consideration until after we have discussed the evidence afforded by the records of the history of the disease in this country during the twenty years over which this inquiry extends. It is sufficient in this place to state that the train of special symptoms which is defined by the term "cholera" as used in this history is uniformly the same for all parts of the country treated of; and this train of special symptoms may be broadly described as consisting of more or less sudden and violent vomiting and purging of what are called "rice-water evacuations," followed quickly by collapse and suppression of urine, which may speedily produce death or may terminate in recovery. But as it is with the fatal results of the disease which this history mainly deals, it is necessary to bear in mind the nature of the symptoms, as above described, which have produced those fatal results. This is the more necessary, also, because, apart from other very important, although not so prominently marked, symptoms which accompany the cholera disease, the above-mentioned train of special symptoms constitutes the characteristic feature of the disease which under the term "cholera" has been the subject of many theories and much varied speculation in respect to its origin and causes.

The main features of the principal theories of cholera which have attracted attention in this country have already been briefly noticed. It remains to state that, notwithstanding the very varied and opposite views held regarding the nature and causes of the disease, there has long been a general consensus of opinion, both in Europe and in India, that in some way or other there is an undoubted and real relation between cholera manifestations and atmospheric phenomena, although nothing definite is known as to the exact nature of this mutual relationship. With a view to this part of the inquiry, I have, so far as has been in my power, under circumstances of very limited means and leisure, appended to the cholera review of each year a brief description of the meteorology of the period, embodying such observations as have appeared to bear upon the subject in hand.

It is necessary, however, to explain that these meteorological records represent merely the average results of the atmospheric changes which have been observed at a few fixed points in each of the several provinces to which they refer. These fixed points or observatory stations have been carefully selected with the object of representing the peculiarities of the several varieties of climate which are met with in the several provinces to which they belong, and the average results of the observations recorded at them may be taken to represent the general features of the meteorology of the region viewed as a whole and in a broad sense, and at the same time as fairly representing any very marked peculiarity of the season in point of divergence from the normal course. But they cannot in the least be taken to represent the actual conditions or features of the local atmospheric phenomena which constitute the climate of any particular place in the province other than the observatory stations themselves; nor can they be taken as a guide to the fluctuations and changes which are everywhere occurring, under a vast variety of forms, in the different elements which go to make up the climate of a place, as the results of the effects of local conditions upon the general physical phenomena of weather and season. Each separate locality, it is necessary to bear in mind, has a climate of its own

more than this, each separate place in any given locality has its own climate, with features of peculiarity proper to itself. The consideration of these points is of the first importance in any endeavour made to trace a connection or relation between cholera and atmospheric phenomena in the light or sense of cause and effect.

It has long been observed as a constant and marked characteristic of cholera that its activity and persistence are greater in localities which are distinguished by particular conditions of situation and soil; and this not only in India, but in Europe also, and, in fact, in every country where cholera is known. And it is a matter of prime importance to examine thoroughly the nature and interdependent action of the special conditions of these particular localities, and the manner in which they are affected by changes of weather and season, and how these, again, affect man. The special characteristics of the particular localities here referred to are a relatively low situation and an absolutely damp soil, generally accompanied with a greater or less impregnation with decomposing organic matters. The effects of weather and season upon such localities, and the influence these effects exercise upon man exposed to their action, will require a very special attention. And when these have been ascertained and understood, we may be able to trace and explain the operation of a similar set of agencies in other localities where cholera prevails, but which have no outward resemblance of physical conditions to the particular localities above specified.

For the prosecution of this inquiry it is essential to have an intimate acquaintance not only with the conditions of the climate of a place visited by cholera, but also with those of its soil, and, in no less degree than either, with those of the persons affected by cholera. Indeed, properly to understand the meteorology and climate of a country, it is an essential requisite to have some knowledge of the principal features of its physical geography. For this reason I have inserted a brief general description of the geographical limits and physical aspects of the several provinces and their districts. By this arrangement it will be made clear what are the points of difference in respect to climate and soil between districts in which cholera is a persistent disease and districts in which it is a regular seasonal visitor, and again districts in which the disease is a stranger.

As regards the conditions peculiar or special to the persons affected by cholera, this is a part of the inquiry which is beset by almost insurmountable difficulties, so far, at least, as concerns the production of statistics for the demonstration of any particular set of conditions which predispose to an attack of the disease. The reason of this is that our statistics deal only with the deaths attributed to cholera and not with the persons attacked by the disease. But, apart from this, there is another reason which, in the present state of our views or knowledge of cholera, renders it impossible to demonstrate with any approach to accuracy the incidence of the disease among the general population; and this is an exact definition of the disease cholera. As stated in a previous passage, our present inquiry deals with cholera only when it presents itself under a certain set of well-marked symptoms. But those symptoms alone do not constitute cholera. They merely represent the last and most dangerous stage of the disease. It is the stage of the disease, however, with which the present inquiry deals, and I must leave to be considered in a later passage what the disease we have presented to us under the term cholera really is. Here it is only necessary to state that, as the mortality from cholera is for the most part confined to the [redacted]lasses of the community, I have added to the review of the cholera

statistics of each year for the several provinces a brief note on the food-supply, by way of index to the conditions of general prosperity or otherwise of the people. The food-supply notes follow those on the meteorology, and, like the latter, deal only with average results; they are not in any way indicative of the distress and privation which have existed in particular districts or portions of the districts, or in particular sections of a city or town population, far less of the poverty and want afflicting families and individuals. Nevertheless, like the notes on the meteorology, they serve the useful purpose of indicating the general condition of prosperity or otherwise of the people of the province to which they refer.

It remains now to describe briefly the general plan and the arrangement of the statistics in the following history of cholera in India during the twenty years from 1862 to 1881 inclusive.

The statistics of the nine provinces—Madras, Bombay, Berar, Central Provinces, Bengal, Assam, Burma, North-Western Provinces and Oudh, and Punjab—are dealt with separately year by year for the whole series of twenty years. For convenience of arrangement and reference the yearly records of each province are kept together, and closed with a statistical review of the whole series for each. Finally, the history is concluded with a statistical and descriptive summary of the several provinces taken together.

In the review of the cholera of each year in the several provinces a uniform plan has been followed throughout. The statistics of the cholera mortality of the civil population for the year are presented at the outset; these are analysed and accompanied by such descriptive matter as I have considered useful in elucidating the history of the disease; then are noticed the incidence of cholera among the troops, European and Native, and the jail populations; and the review of the year is concluded with a brief description of its salient meteorological peculiarities and a note on the nature of the food-supply in respect to cheapness or the reverse. To save repeated reference hereafter it is well here to state once for all the sources whence the details of the following history are derived. The statistics of cholera mortality among the civil populations, as well as the details of the circumstances described as attending the prevalence of the disease in each year, are derived from the published official Annual Sanitary Reports for the several provinces. The corresponding particulars regarding the troops, European and Native, and the jail populations, are derived also partly from the same sources, and from Bryden's "Cholera in the Bengal Presidency" (1874), but mostly from the "Annual Reports of the Sanitary Commissioner with the Government of India." The meteorological details are derived partly from the "Provincial Sanitary Reports" for the years concerned, and latterly from the "Annual Meteorological Reports of the Meteorological Reporter to the Government of India." For the rainfall statistics I am indebted to the courtesy of Mr. H. Blanford, F.R.S., &c., &c., Meteorological Reporter with the Government of India, to whom I take this opportunity of expressing my grateful acknowledgments. The food-supply statements have been derived partly from the "Provincial Sanitary Reports," partly from the "Financial Department Reports," and partly from the "Provincial Administrative Reports." And lastly, the descriptions of the physical geography of the several provinces have been derived from Hunter's "Imperial Gazetteer of India."

SECTION II.

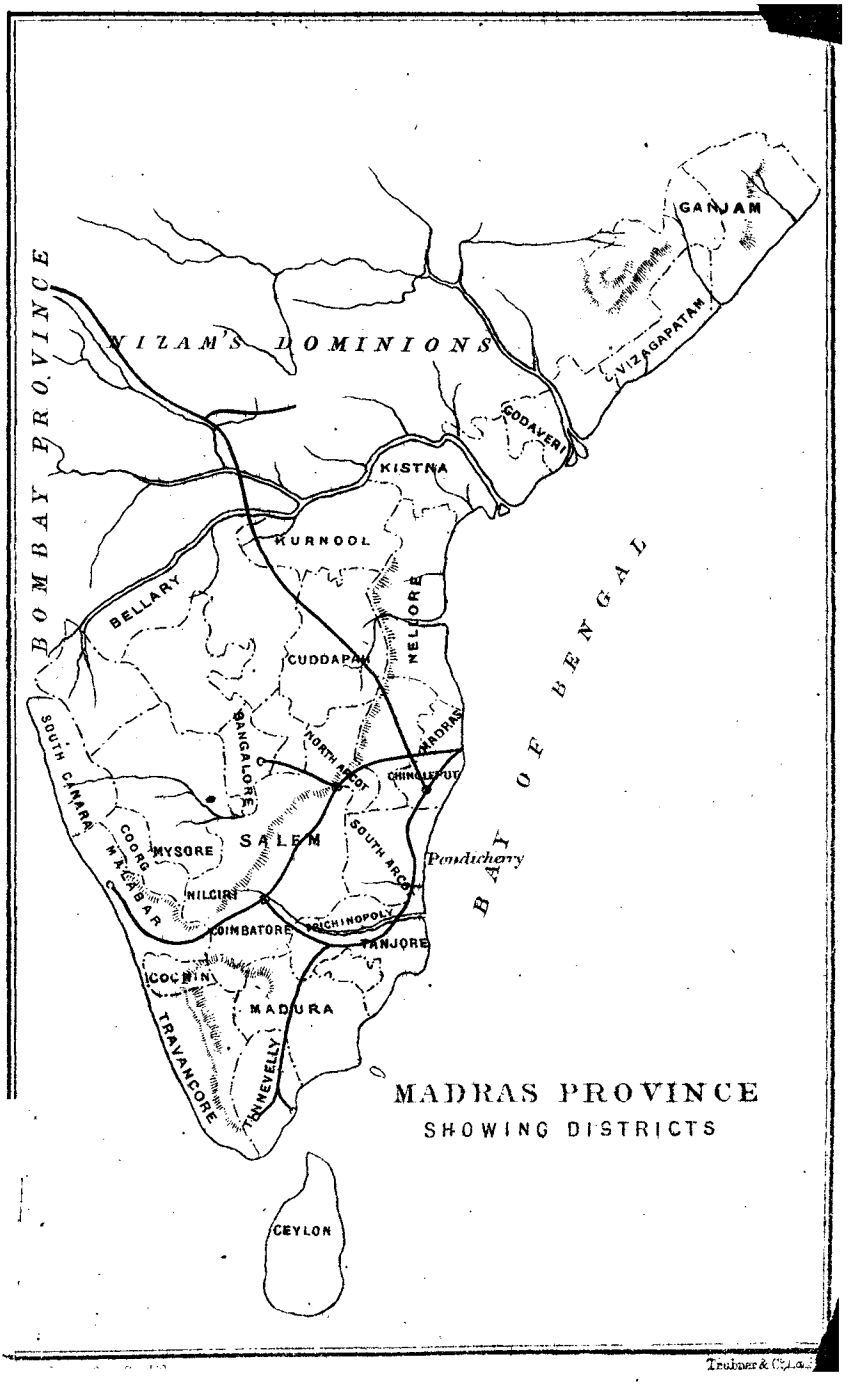
MADRAS PROVINCE.

Geographical Position.

THE Madras Province occupies, with its dependencies, the entire south of the Peninsula of India. Its extreme length from north-east to south-west is about 950 miles; its extreme breadth about 450 miles. The divisions, districts, area, and population of the territory under British administration are shown in the annexed tabular statement.

STATEMENT *showing Population, Area, and Density of Population in each District of the Madras Province for the Year* 1871.

Divisions.	Districts.	Population (Census 1871).			Grand Total of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Northern.	Ganjam . . .	695,090	693,529	1,388,619	6,276,291	8,313	40,917	182·9	153·4
	Vizagapatam .	940,515	902,988	1,843,503		18,344		117·7	
	Godavari . .	803,149	788,954	1,592,103		6,224		255·9	
	Kistna . . .	737,319	714,747	1,452,066		8,036		180·7	
Presidency.	Nellore . . .	707,222	669,261	1,376,483	4,448,256	8,462	16,115	162·7	276·0
	Madras Town .	186,596	195,330	381,926		27		14,724·1	
	Chingleput . .	473,828	460,695	934,523		2,753		340·7	
	South Arcot .	885,665	869,659	1,755,324		4,873		360·3	
Southern.	Trichinopoly .	587,390	611,765	1,199,155	7,131,878	3,515	21,847	341·5	326·4
	Tanjore . . .	953,492	1,019,328	1,972,820		3,654		540·1	
	Madura . . .	1,111,880	1,154,394	2,266,274		9,502		238·5	
	Tinnevelly . .	836,332	857,297	1,693,629		5,176		327·3	
Ceded.	Kurnool . .	467,517	446,716	914,233	3,931,015	7,358	26,732	130·4	147·0
	Cuddapah . .	693,280	657,687	1,350,967		8,367		161·5	
	Bellary . . .	858,649	807,166	1,665,815		11,007		151·5	
Central.	North Arcot .	1,020,119	994,135	2,014,254	5,743,295	7,139	22,054	282·3	260·4
	Salem . . .	975,140	991,222	1,966,362		7,483		262·9	
	Coimbatore .	874,642	888,037	1,762,679		7,432		237·3	
Malabar.	Nilgiri . . .	38,366	34,030	72,396	3,218,666	749	10,653	66·0	302·1
	South Kanara.	459,550	458,492	918,042		3,902		235·4	
	Malabar. . .	1,117,573	1,110,655	2,228,228		6,002		376·7	
Total of the province		15,423,314	15,326,087	30,749,401		138,318		226·2	


BOMBAY PROVINCE
NIZAM'S DOMINIONS
GANJAM
VIZAGAPATAM
GODAVERY
KISTNA
KURNOOL
BELLARY
CUDDAPAH
NELLORE
MADRAS
BAY OF BENGAL
SOUTH CANARA
BANGALORE
NORTH ARCOT
CHINGLEPUT
COORG
MALABAR
MYSORE
SALEM
SOUTH ARCOT
Pondichery
NILGIRI
COIMBATORE
DINDIGUL
TANJORE
COCHIN
MADURA
TRAVANCORE
TINNEVELLY
CEYLON
MADRAS PROVINCE
SHOWING DISTRICTS

The five Native States in political dependence on Madras, namely, Travancore, Cochin, Puducottah, Banganapalli, and Sandhúr, have an additional area of 9818 square miles, and 3,289,392 inhabitants. For these no statistics are available, and they are not dealt with in this history.

The province is washed by the open sea on every side but the north. On the east coast is the Bay of Bengal, the coast-line extending continuously from south-west to north-east for nearly 1200 miles, from Cape Comorin to Chilka Lake. The western coast is formed by the shore of the Indian Ocean for about 540 miles. Off the south-east lies the Island of Ceylon, separated by a shallow strait, across which runs the string of rocks and sandbanks known as "Adam's Bridge." The irregular northern boundary of the province has been formed by accidents of history. On the extreme north-east is the Bengal Province of Orissa; next come the wild highlands of the Central Provinces; then, for a long stretch, the Dominions of the Nizam of Haidarabad, separated by the Kistna River and its tributary the Tungabhadara; lastly, on the north-west and west, the Bombay districts of Dharwar and North Kanara. The Native State of Mysore occupies a large portion of the centre of the area thus defined, and geographically forms a part of the Madras Province.

Physical Aspects.

Viewed on the map, Madras presents a very broken aspect. Its eastern coast extends up the Peninsula more than twice as far as its western, whilst its heart seems to be eaten out by the intruding state of Mysore. From a physical point of view, it may be roughly divided into three portions—(1.) The long and broad eastern coast; (2.) the shorter and narrower western coast; and (3.) the high tableland in the interior. These divisions are determined by the two great mountain ranges of the Eastern and Western Ghats, which give the key to the configuration of all Southern India. The Eastern Ghats, which lie entirely within this province, form a continuation of the confused hill system of Chhota Nagpur. They run in a south-westerly direction almost through the entire length of Madras, until they lose themselves in the Nilgiris, and there join with the western range. Their average height is only 1500 feet, and for the most part they have a broad expanse of low land between their base and the sea. Their line is pierced by three great rivers, the Godavari, Kistna, and Kaveri, as well as by minor streams, so that they do not perform the part of a watershed. The Western Ghats, on the other hand, which stretch southwards continuously along the shore of the Indian Ocean from the north of Bombay, satisfy all the characteristics of a mountain range. Rising steeply at a distance of 30 to 50 miles in the Madras districts from the coast, they catch almost the whole rainfall of the monsoon, and in the south not a single stream breaks through their barrier. Some of their peaks attain an elevation of more than 5000 feet. Between these two bordering ranges lies the central tableland, with an elevation of from 1000 to 3000 feet, which includes the whole of Mysore, and extends over about half a dozen districts of Madras. Each of these three divisions has natural features of its own. The eastern coast possesses the deltas of the three great rivers, where artificial irrigation has combined with natural fertility to reward the toil of the husbandman. On the west coast the rainfall never fails, but cultivation is hemmed in within narrow limits by the mountains and the sea. In the central plateau the country is generally bare, the rainfall light, and the means of irrigation difficult; but it contains many tracts of fertile soil, and the cultivator does his best to store in tanks the local showers which the monsoons bring to him from either coast.

The three principal rivers of Madras are the Godavari, the Kistna, and the Kaveri, each with a large tributary system of its own. All of these rivers have the same uniform features. They rise in the Western Ghats, and run right across the peninsula in a south-easterly direction into the Bay of Bengal. They drain rather than water the upper country through which they flow, and, like other rivers which fall into the Bay of Bengal, all of them spread over alluvial deltas before they reach the sea.

The Eastern and Western Ghats, already described, constitute the two main hill systems of the province. The Nilgiris, which join these two ranges, culminate in Dodabetta (8640 feet), the loftiest peak in Southern India. There are, besides, many outlying spurs and tangled masses of hills, of which the Shevaroys in Salem, the Annamallais in Coimbatore, and the Pulni Hills in Madura are the most important. South of the Palghát gap, where the range is cut down to within 1000 feet of the sea-level by a break 25 miles wide, the Western Ghats resume their course at full level right down to Cape Comorin, and immediately widen out into the highland tract that lies between Madura on the one side, and Malabar, Cochin, and Travancore on the other, known as the Annamallais in Coimbatore, and as the Pulnis in Madura. Towards the south this hill tract narrows, and behind Tinnevelly becomes only a mountain range between the two

coasts, with a restricted area. On the western coast the perpetual antagonism between the mountain torrents and the ocean has produced a remarkable series of backwaters or lagoons, which fringe the entire seaboard of Kanara, Malabar, and Travancore, and are used for inland navigation.

The climate of Madras varies in the different parts of the province, being determined by the very diverse geographical conditions. The Nilgiri Hills enjoy the climate of the temperate zone, with a moderate rainfall and a thermometer rarely exceeding 80° F., and sometimes falling to freezing-point. On the Malabar coast the south-west monsoon brings an excessive rainfall, reaching 150 inches in the year at certain spots. The rain clouds hanging on the slope of the Western Ghats sometimes obscure the sun for month after month. Along the eastern coast and on the central tablelands the rainfall is comparatively low, but the heat of the summer months is excessive. The whole coast of the Bay of Bengal is liable to disastrous cyclones, which have repeatedly overwhelmed the low-lying ports.

Cholera History, Statistical and Descriptive.

The annexed tabular statements show the statistics of cholera mortality in the Madras Province during the period dealt with in this inquiry. In Nos. I. and II. is shown the annual mortality from cholera by districts and by months respectively. In Nos. III. and IV. are shown the number of admissions and deaths from cholera, together with the average strength, and ratio of admissions and deaths per mille of strength, among the European and Native troops and jail populations, and the percentage of admissions to strength of the affected groups, and deaths to admissions, together with the total average strength of each class respectively. In No. V. is shown the yearly prevalence of cholera by the death-rates among the troops and jail populations, and among the "civil population," together with the average rainfall and the average price of the staple food-grain, namely, millet. And in No. VI. is shown the annual rainfall for each district.

These several returns exhibit at one view the statistical information which has been recorded regarding the prevalence of cholera in the Madras Province during the twenty years dealt with in this inquiry, together with corresponding data relating to the rainfall and food-supply. In No. II. is exhibited the seasonal prevalence of the disease, showing its periods of annual activity and decline; whilst in No. I. is shown the annual prevalence of cholera by districts. In the statement No. V. the accurate statistics recorded in the military and jail returns are contrasted with the less accurate records relating to the mortality from cholera among the civil population. It will be noticed, in respect to the latter, that whatever the amount of numerical defect in registration may be, that defect runs all through the series of years for which the returns are available, but that, at the same time, the returns, such as they are, bear a constant and uniform relation in consonance with the results attained from the more accurate records relating to the former classes, thus indicating that the influences which cause or favour the activity of cholera operate similarly in respect to the two great classes for which the statistics are separately recorded. These several tables are worthy of careful study and comparison in connection with the descriptive details which are summarised in the following pages regarding the course and progress of the disease in each year of the series. In this place it will suffice to draw attention to the annual seasonal distribution of the rainfall and the annual average price of the staple food-grain in their relation to the prevalence of cholera, and to point to the constant concurrence of high prices—the result of defective rainfall—with aggravated cholera mortality, and also to the remarkable tendency of the disease to a periodic revival and decline in each triennial cycle of years from 1863 onwards, the regularity of which is occasionally disturbed, as in the years 1865 and 1877, by prolonged periods of drought and famine.

No. I.

STATEMENT *showing the Annual Total Deaths registered from Cholera among the Civil Population in each of the Districts of the Madras Province from the Year* 1866 *to* 1881.

Districts.	Total Cholera Deaths Registered among the Civil Population in the Years															
	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Ganjam . . .	24,929	548	207	1,033	382	96	3,441	83	243	342	3,926	3,290	8,384	73	495	171
Vizagapatam .	11,695	145	121	638	259	53	5,263	...	...	...	1,273	6,923	4,456	574	46	216
Godavari . .	16,272	575	9	...	13,305	202	1,362	...	...	12	6,977	7,072	9,548	9,014	8	2
Kistna . . .	5,591	3,700	21	3	2,054	1,126	189	95	...	40	6,727	12,374	6,231	2,389	3	...
Nellore . . .	5,674	1,090	6	1,118	613	1,140	85	497	...	3,017	8,385	19,476	314	13	4	...
Madras town .	2,984	717	13	568	861	493	5	6	...	879	2,025	6,246	64	34	2	123
Chingleput. .	9,294	2,283	24	1,237	1,394	643	42	...	...	1,503	1,950	4,391	85	6	...	25
South Arcot .	8,932	4,547	550	571	3,248	734	758	50	19	8,334	9,543	25,783	2,096	118	8	136
Trichinopoly .	7,168	1,639	2,201	611	2,557	1,127	128	...	...	7,271	5,274	15,447	484	40	1	1,804
Tanjore . . .	8,978	8,394	2,508	4,967	6,584	945	120	54	33	18,125	8,015	13,098	2,744	894	23	2,801
Madura . . .	12,001	2,056	293	73	5,656	596	94	25	...	11,601	2,703	15,647	275	28	1	272
Tinnevelly . .	3,186	2,254	94	83	7,611	2,838	...	...	...	6,514	6,195	14,214	318	...	...	2,206
Kurnool. . .	7,685	368	...	3,140	...	18	129	...	...	886	11,758	10,451	1,896	...	...	1
Cuddapah . .	14,823	323	14	1,881	134	957	...	...	...	4,651	11,574	33,102	3,261	1	...	6
Bellary . . .	22,833	10	...	3,652	...	71	...	...	...	2,386	16,129	30,183	4,626	...	3	121
North Arcot .	10,475	2,511	322	2,633	3,595	2,144	998	2	1	5,863	14,975	42,145	74	...	...	494
Salem . . .	12,593	812	1,071	317	3,524	2,265	571	6	...	6,539	14,759	47,633	697	...	...	540
Coimbatore .	9,377	603	368	206	2,323	1,281	20	...	2	12,930	4,049	36,622	365	...	...	432
Nilgiri . . .	...	...	...	...	...	5	1	...	...	12	25	476	17	...	2	...
South Kanara .	2,429	462	114	194	267	525	...	...	2	8	618	2,900	349	...	12	77
Malabar. . .	4,042	271	100	157	1,500	397	46	22	13	3,633	11,303	9,957	883	112	5	19
Totals . .	200,965	33,308	8,036	23,082	55,867	17,656	13,262	840	313	94,546	148,193	357,430	47,167	13,296	613	9,446

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Madras Province for Twenty Years from* 1862 *to* 1881.

Years.	Cholera Deaths Registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera epidemic, except on Western coast.															...	?
1863	Cholera actively epidemic, Western coast included.															...	45·53
1864	Cholera epidemic, except in northern districts of Eastern coast.															...	43·82
1865	Cholera epidemic all over Southern India.															...	40·24
1866	10,713	9,787	7,656	7,858	7,524	13,241	24,911	39,070	35,380	17,491	13,623	13,767			200,965	8·94	42·12
1867	12,082	4,718	2,554	2,628	1,261	1,690	2,560	2,220	1,443	637	647	868			33,308	1·49	36·62
1868	3,617	1,760	1,084	502	300	140	201	127	86	66	60	93			8,036	0·36	41·86
1869	175	203	475	446	477	2,575	5,025	3,100	2,424	1,907	2,208	4,067			23,082	0·87	44·66
1870	6,363	2,743	1,887	2,091	4,442	8,566	10,305	9,249	3,630	2,114	1,702	2,775			55,867	2·32	47·63
1871	4,474	3,156	1,652	1,572	1,103	1,279	1,330	906	666	269	376	873			17,656	0·72	47·11
1872	1,157	669	453	881	1,668	2,380	2,667	2,244	593	271	197	82			13,262	0·43	56·95
1873	371	166	27	23	46	29	24	16	42	69	21	6	458	382	840	0·03	42·78
1874	32	29	13	12	17	10	57	103	25	3	5	7	182	131	313	0·01	52·82
1875	8	16	6	84	1,633	5,892	14,162	12,918	13,538	13,972	16,017	16,300	50,491	44,055	94,546	3·12	39·38
1876	14,607	11,603	8,299	10,834	11,463	14,681	18,641	10,363	5,265	3,280	7,894	31,183	81,541	66,682	148,193	5·08	30·18
1877	58,712	51,211	43,753	31,005	37,139	25,921	27,353	31,737	24,501	10,390	8,416	7,292	200,803	156,627	357,430	12·24	49·11
1878	4,439	1,985	2,981	2,726	4,160	5,368	8,343	7,525	5,432	1,659	983	1,566	25,463	21,704	47,167	1·62	53·13
1879	2,948	1,060	561	333	450	1,601	4,228	1,671	310	109	24	4	6,934	6,362	13,296	0·46	46·23
1880	9	24	12	52	175	58	40	10	2	3	9	219	315	298	613	0·02	48·37
1881	51	4	12	92	92	151	16	1	4	297	1,323	7,403	4,870	4,576	9,446	0·30	38·64
Means	7,485	5,571	4,464	3,821	4,497	5,224	7,491	7,579	5,834	3,283	3,344	5,403	41,225	33,424	63,996	2·37	44·58

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the Madras Province in Inches and Cents. for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	RAINFALL IN INCHES AND CENTS. IN THE MONTHS OF												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	No information.												
1863	0·09	0·07	1·24	3·59	2·36	6·94	8·89	5·74	4·32	7·62	2·21	2·46	45·53
1864	0·01	0·01	0·02	1·05	2·32	7·30	8·39	7·21	4·45	6·77	5·31	0·98	43·82
1865	0·06	0·36	0·14	2·91	4·27	5·34	6·25	6·96	4·27	4·30	4·05	1·33	40·24
1866	0·10	0·24	0·01	0·96	1·71	3·85	6·12	5·44	5·09	10·23	3·27	5·10	42·12
1867	0·18	0·10	0·42	0·76	2·19	4·43	6·67	7·21	5·21	7·62	1·48	0·35	36·62
1868	2·21	0·16	0·19	0·87	2·11	11·64	8·69	3·50	4·66	4·87	2·72	0·24	41·86
1869	0·22	0·18	0·39	1·18	1·47	6·16	8·01	6·36	7·04	5·49	5·98	2·17	44·66
1870	1·64	0·02	0·30	0·56	1·24	6·43	6·33	7·13	7·18	11·23	4·17	1·40	47·63
1871	1·74	0·65	1·20	1·34	2·92	6·48	8·57	4·00	6·66	4·48	8·43	0·64	47·11
1872	0·04	0·14	0·22	1·32	4·23	7·03	9·05	8·58	5·86	7·70	9·18	3·60	56·95
1873	0·01	2·31	0·13	1·98	2·32	5·01	5·61	5·53	5·07	10·83	2·78	1·20	42·78
1874	0·06	0·24	0·11	1·08	6·68	7·68	8·08	4·43	9·78	9·23	4·20	1·25	52·82
1875	0·20	0·05	0·35	1·35	2·56	5·81	5·92	7·05	5·83	7·20	2·05	1·01	39·38
1876	0·01	0·00	0·50	0·85	2·23	4·95	6·84	6·02	3·99	2·34	1·76	0·69	30·18
1877	0·21	0·53	1·54	0·71	4·96	6·52	3·04	5·06	7·70	10·00	4·67	4·17	49·11
1878	0·33	0·01	0·18	1·77	3·26	6·73	7·90	11·47	8·28	7·13	3·51	2·56	53·13
1879	0·60	0·14	1·58	0·52	6·04	5·47	7·74	6·96	4·49	7·29	4·21	1·18	46·22
1880	0·26	0·38	0·01	1·42	2·63	6·09	6·11	5·96	4·63	6·91	11·47	2·50	48·37
1881	0·22	0·00	0·66	0·39	2·07	4·25	3·28	9·17	6·99	2·90	6·40	2·31	38·64
Means	0·43	0·29	0·48	1·29	3·03	6·22	6·92	6·51	5·87	7·06	4·62	1·84	44·59

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the Madras Province, together with the Average Strength and Ratio of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Total.			Ratio per Mille.	
		Cholera.			Cholera.			Cholera.			Cholera.			
	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Admissions.	Deaths.
1862	9,623	37	14	25,682	187	72	7,598	148	76	42,903	372	162	8·67	3·78
1863	9,117	22	16	24,580	92	47	7,846	439	226	41,543	553	289	13·31	6·96
1864	9,823	34	17	22,816	224	96	8,565	170	80	41,204	428	193	10·39	4·68
1865	9,900	43	22	21,977	219	106	8,375	271	136	40,252	533	264	13·24	6·56
1866	8,189	38	24	21,230	181	78	9,457	451	242	38,876	670	344	17·23	8·85
1867	7,873	10	4	20,910	39	19	10,362	20	9	39,145	69	32	1·76	0·82
1868	7,288	...	...	20,907	10	7	10,051	8	3	38,246	18	10	0·47	0·26
1869	8,380	27	15	18,417	53	23	9,833	89	43	36,630	169	81	4·61	2·21
1870	8,315	18	12	18,378	29	14	9,771	41	15	36,464	88	41	2·41	1·12
1871	7,942	76	36	17,871	15	8	9,299	15	7	34,112	106	51	3·11	1·49
1872	8,292	2	1	18,422	11	3	9,299	26	13	36,013	39	17	1·08	0·47
1873	8,263	...	...	15,815	...	...	9,250	4	1	33,328	4	1	0·12	0·03
1874	7,985	1	...	18,561	...	...	9,912	2	...	36,458	3	...	0·08	...
1875	7,400	5	4	14,229	87	37	9,849	95	40	31,478	187	81	5·94	2·57
1876	7,534	20	10	18,631	79	40	10,755	222	108	37,120	321	158	8·65	4·26
1877	7,730	21	10	18,734	189	74	20,328	1029	531	46,792	1239	615	26·48	13·14
1878	7,575	27	20	18,638	89	48	21,315	262	110	47,528	378	178	7·95	3·74
1879	6,120	...	...	13,318	4	2	15,310	62	22	34,748	66	24	1·90	0·69
1880	6,506	...	...	13,593	2	1	11,657	1	1	31,756	3	2	0·09	0·06
1881	6,487	3	...	18,126	50	25	10,332	89	33	34,945	142	58	4·06	1·06

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the Madras Province during the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.-				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	9,623	8,576	0·43	38	25,682	20,413	9·16	38	7,598	5,532	2·69	51
1863	9,117	7,318	0·30	73	24,580	14,377	0·64	51	7,846	5,413	8·11	51
1864	9,823	6,095	0·56	50	22,816	15,356	1·46	43	8,565	4,168	4·08	47
1865	9,900	7,988	0·54	51	21,977	16,550	1·32	49	8,375	5,495	4·93	50
1866	8,189	6,895	0·55	63	21,230	17,348	1·04	43	9,457	7,789	5·79	54
1867	7,873	5,951	0·17	40	20,910	14,127	0·28	47	10,362	3,370	0·59	45
1868	7,288	...	...	...	20,907	5,870	0·17	70	10,051	1,065	0·75	37
1869	8,380	6,377	0·42	55	18,417	10,425	0·51	43	9,833	2,741	3·25	48
1870	8,315	4,761	0·38	67	18,378	10,803	0·27	48	9,771	2,792	1·47	36
1871	7,942	4,578	1·66	47	17,871	8,400	0·18	53	9,299	2,925	0·51	47
1872	8,292	2,661	0·07	50	18,422	4,937	0·22	27	9,299	1,365	1·90	50
1873	8,263	...	...	...	15,815	...	...	...	9,250	980	0·41	25
1874	7,985	66	1·51	...	18,561	...	...	...	9,912	759	0·26	...
1875	7,400	1,215	0·41	80	14,229	12,227	0·71	42	9,849	4,081	2·33	42
1876	7,534	4,312	0·46	50	18,631	13,903	0·57	51	10,755	7,422	2·99	49
1877	7,730	6,553	0·32	48	18,734	14,723	1·28	39	20,328	17,718	5·81	51
1878	7,575	4,421	0·61	74	18,638	9,400	0·95	54	21,315	10,625	2·46	42
1879	6,120	...	...	...	13,318	1,650	0·24	50	15,310	1,327	4·97	33
1880	6,506	...	...	...	13,593	2,093	0·09	50	11,657	206	0·48	100
1881	6,487	2,407	0·12	...	18,126	7,313	0·68	50	10,332	1,375	6·47	37

No. V.—*Statement showing the Yearly Prevalence of Cholera as represented by the Death-rates registered among the Troops and Jail Populations, and among the Civil Population, in the Madras Province, for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Millet.*

Years.	Cholera Death-rate per Mille of Strength or of Population.					Average Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Fractions per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Populations.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	1·45	2·80	10·00	3·78	?	?	?	?	?	?	24·83
1863	1·75	1·91	28·80	6·96	?	45·53	1·40	12·89	18·95	12·29	22·27
1864	1·73	4·21	9·34	4·68	?	43·82	0·04	10·67	20·05	13·06	23·27
1865	2·22	4·82	16·24	6·56	?	40·24	0·56	12·52	17·48	9·68	19·97
1866	2·93	3·67	25·59	8	8·94	42·12	0·35	6·52	16·65	18·60	14·07
1867	0·01	0·91	0·87	0·82	1·49	36·62	0·70	7·38	19·09	9·45	13·80
1868	...	0·33	0·30	0·26	0·46	41·86	2·56	14·62	16·85	7·83	22·77
1869	1·79	1·25	4·37	2·21	0·87	44·66	0·79	8·81	21·41	13·64	20·93
1870	1·44	0·76	1·53	1·12	2·32	47·63	1·96	8·23	20·64	16·80	22·75
1871	4·54	0·45	0·75	1·49	0·72	47·11	3·59	10·74	19·23	13·55	33·87
1872	0·12	0·16	1·40	0·47	0·43	56·95	0·40	12·58	23·49	20·48	28·85
1873	...	...	0·11	0·03	0·03	42·78	2·45	9·31	16·21	14·81	26·62
1874	...	...	...	...	0·01	52·82	0·41	15·44	22·29	14·68	24·79
1875	0·54	2·60	4·06	2·57	3·12	39·38	0·60	9·72	18·80	10·26	24·74
1876	1·33	2·15	10·04	4·26	5·08	30·18	0·51	8·03	16·85	4·79	21·22
1877	1·29	3·95	26·12	13·14	12·24	49·11	2·28	12·19	15·80	18·84	11·32
1878	2·64	2·57	5·16	3·74	1·62	53·13	0·52	11·76	27·65	13·20	12·37
1879	...	0·15	1·44	0·69	0·46	46·22	2·32	12·03	19·19	12·68	17·83
1880	...	0·07	...	0·06	0·02	48·37	0·65	10·14	16·70	20·88	28·70
1881	...	1·38	3·19	1·66	0·31	38·64	0·88	6·71	19·44	11·61	31·62

For the triennial monsoon rainfall the sums of the second and third and third and fourth quarters of each year must be included together, owing to the double monsoon in this province.

No. VI.

STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the Madras Province for the Twenty Years,* 1862 *to* 1881.

Districts.	Stations.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Ganjam . .	Ganjam . .	No information.	46·70	33·15	24·69	42·71	48·70	29·17	37·46	38·63	24·05	53·60	44·95	34·60	45·15	35·70	37·52	52·96	45·94	67·86	36·53
Vizagapatam	Vizianagram		19·80	17·10	24·00	37·60	41·00	24·50	34·20	57·50	28·40	41·00	40·70	38·90	37·50	38·28	45·90	78·60	34·80	54·25	45·90
Godavari . .	Rajamandri .		30·60	28·60	30·25	50·30	28·85	35·65	25·18	36·64	38·52	53·90	48·00	28·50	35·37	28·81	29·40	61·50	41·60	29·95	38·85
Kistna . .	Guntoor . .		24·60	31·00	33·60	29·53	53·48	31·75	27·10	35·28	31·03	38·82	30·45	32·89	32·49	18·77	37·76	47·48	43·93	31·56	24·10
Nellore . .	Nellore . .		31·63	34·21	20·15	34·66	23·29	28·57	25·63	43·77	43·40	51·72	40·07	40·95	27·22	13·51	42·36	28·60	40·17	53·49	35·75
Madras Town	Observatory.		54·61	47·23	41·64	51·39	24·37	41·43	32·31	74·10	56·35	73·67	45·83	62·96	37·12	16·60	66·20	28·65	54·25	61·80	44·04
Chingleput .	Conjeveram .		29·50	36·50	34·67	47·60	30·20	31·40	25·48	42·38	47·34	72·09	31·00	69·94	20·28	23·87	38·54	37·76	41·33	40·87	33·80
South Arcot	Cuddalore .		13·37	25·03	25·12	37·40	26·38	32·57	48·99	53·54	54·04	77·70	49·01	45·79	37·54	29·57	57·32	30·34	48·93	57·60	31·00
Trichinopoly	Trichinopoly		95·30	64·64	61·90	27·01	22·50	38·95	47·88	42·49	34·00	41·42	41·85	30·26	31·09	20·36	37·94	26·55	26·34	34·56	29·22
Tanjore . .	Tanjore . .		36·61	27·80	17·25	11·20	7·00	6·80	40·90	38·20	39·60	46·98	38·66	30·20	27·65	23·88	38·46	29·10	35·05	43·02	30·85
Madura . .	Madura . .		26·53	34·42	31·18	28·74	25·51	37·90	31·77	27·82	36·70	37·63	26·85	30·81	46·72	20·67	54·04	37·88	32·02	35·34	32·56
Tinnevelly .	Tinnevelly .		23·51	22·28	19·05	35·30	37·40	32·05	41·47	22·18	35·85	26·10	18·17	26·38	17·43	18·98	43·11	24·58	32·52	40·05	22·72
Kurnool . .	Kurnool . .		33·94	37·47	40·66	41·46	34·31	31·24	19·10	36·38	22·97	29·18	19·39	50·51	25·18	8·59	22·40	48·17	19·77	20·27	19·97
Cuddapah .	Cuddapah .		27·80	11·60	14·10	19·50	14·10	30·40	30·35	40·81	17·58	36·95	32·03	58·50	29·60	9·45	20·91	48·66	32·36	31·17	37·65
Bellary . .	Bellary . .		9·80	15·90	12·30	13·70	13·85	22·56	14·69	14·97	16·17	18·06	19·83	24·89	17·52	7·23	23·98	24·96	23·28	22·37	16·10
North Arcot	Vellore . .		12·33	34·64	23·83	41·09	18·74	27·70	32·58	46·65	50·55	49·95	35·78	58·09	29·50	20·28	44·11	44·61	31·94	41·28	36·57
Salem . . .	Salem . . .		30·10	22·40	50·40	22·50	29·10	29·40	31·00	39·68	30·15	41·95	32·25	35·48	37·97	26·49	42·52	33·61	42·65	50·89	47·08
Coimbatore .	Coimbatore .		21·40	16·54	22·13	25·79	12·47	16·15	20·16	17·54	25·54	24·21	22·87	19·10	22·89	19·31	27·39	17·69	19·08	28·95	22·64
Nilgiri . . .	Shevaroyhills*		49·10	59·10	64·51	58·50	41·50	71·00	82·50	62·30	54·18	90·50	45·90	62·05	52·80	34·55	69·37	65·22	57·70	57·73	51·65
South Kanara	Mangalore .		150·47	120·28	128·51	127·61	116·39	139·27	105·38	125·77	161·31	164·54	115·74	175·11	108·11	121·47	133·08	182·30	155·18	117·57	95·50
Malabar . .	Cannanore .		188·56	200·47	125·17	100·82	125·91	140·70	183·39	103·50	141·59	125·37	119·05	153·31	107·86	97·46	119·10	106·42	111·92	95·38	79·01

* The Shevaroy Hills are in the Salem district.

I now proceed to give a brief account of the cholera in each year of the series as derived from the records of the several published Annual Reports referring to this province.

1862.—There are no statistics to show the monthly prevalence of cholera in this province until the year 1866; but from the returns of the incidence of the disease among the troops and jail populations in the Madras Province, and among the troops quartered at stations in the adjoining Native States of Haidarabad and Mysore, it appears that cholera was widely prevalent in 1862 over the greater portion of Southern India. The activity of the disease is recorded in some of the Deccan districts of Haidarabad and Mysore, and in some of the districts of each of the six divisions of the Madras Province, and, taking them altogether, the disease was active in some part or other of the Southern Peninsula during each month of the year. During the first three months of the year the activity of cholera among the troops and jails was almost wholly confined to the districts of the Southern, Centre, and Presidency divisions, and during the last three months of the year the disease again became active in those parts. During the intervening six months —April to September inclusive—the returns show the disease to have been mainly prevalent in the northern and ceded districts of Madras and in the Native States of Haidarabad and Mysore. On the Malabar coast and in the northern districts of the eastern coast the cholera of 1862 appears to have prevailed, but very mildly, throughout the year. In the town of Madras itself a total of 3635 deaths from cholera was registered during this year, and there was a distinct accession of epidemic prevalence during the months of June and July.

The returns show that the cholera of 1862 was actively prevalent in the month of April all over the Southern Peninsula, from north to south and from east to west. During the preceding three months the disease was almost wholly confined to the southern districts of the Peninsula, but after April it subsided into quiescence in these areas, and with the advent of the south-west monsoon rains broke into activity in the districts of the central and northern divisions. In these areas the disease continued to prevail until the close of the south-west monsoon, after which it again resumed activity in the southern districts concurrently with the prevalence in them of the north-east, or cold weather, monsoon rains.

In Southern India the climate is divided into three seasons, namely, *the cold and wet*, from October to January, during the north-east monsoon; *the hot and dry*, from February to May, between the two monsoons; and *the hot and wet*, from June to September, during the south-west monsoon. These three seasons appear to exercise a marked and fixed influence upon the prevalence or abeyance of cholera, according to the physical conditions of the different areas over which their influence operates, as is shown by the varied course of cholera during a series of years in the same tracts, as they are variously affected by the meteorological phenomena of each season in successive years.

There are certain districts in the Madras Presidency which, in their conditions of soil and climate, approach very nearly to the conditions of soil and climate which characterise the area of Lower Bengal, the acknowledged natural habitat of cholera. The delta of the Kaveri River is one of these, with "a deep alluvial subsoil, permeable by water at all seasons of the year, and often for months together completely saturated by irrigation from innumerable streams." This tract is proved to be a favourite haunt of cholera, and, as in Lower Bengal, it is during the desiccation of the surface

soil, which occurs annually with the falling of the river stream and sinking of the subsoil moisture to a lower level, that the activity of cholera in Tanjore and Trichinopoly is most prevalent. Salem is another district of the same physical characters. The conditions of climate in the Kaveri delta are not so closely similar to those in the Ganges delta as are the conditions of soil, the difference being that the southern delta is hot and dry in climate, with but little variation of temperature in comparison with the northern delta, in which the heat is combined with a greater amount of moisture and a wider range of temperature.

In their physical features the districts on the western coast in many respects bear a resemblance to the low moist tracts of Bengal. The northern districts on the eastern coast may be included in the same category. Ganjam, which adjoins the Bengal endemic area of cholera, "suffers in common with the endemic district as regards time and season" of cholera. Vizagapatam, Godavari, and Kistna districts, occupying a tract on the sea-board of the Coromandel coast south of Ganjam, extend from thirty to forty miles inland, and are composed of flat, sandy, alluvial plains, which along the whole sea-board are irrigated by canals from the Godavari and Kistna Rivers. The western portion of these districts is hilly and jungly, and includes the Golconda chain of hills, which constitute the Eastern Ghats. These hills divide the eastern coast districts from the tablelands of the Deccan and Jaypur, and, with the Western Ghats of the Malabar coast, enclose the plateau of Mysore.

In its physical features the delta of the Godavari River, in respect to conditions of soil and subsoil moisture, is almost identical with those of the delta of the Kaveri (Cauvery) River in Tanjore.

Yet there are some "important distinctions in the sanitary history of the two deltas, namely, that cholera is often completely absent from the Godavari delta for long periods together, while in Tanjore it is nearly always present, and that the Godavari district is especially liable to a heavy fever mortality after the setting-in of the north-east monsoon, while in Tanjore the mortality from this cause is always low, and is less influenced apparently by monsoon rains. The Godavari delta, moreover, usually feels the cholera influence most severely during the season of the south-west monsoon, and that of the Kaveri during the north-east monsoon. The former district is liable to rainfall from both monsoons, but Tanjore receives its greatest rainfall during the north-east monsoon. Both districts are brought under irrigation when the Kaveri and Godavari Rivers are filled by the south-west monsoon rains."

The Coimbatore district, in its western portion, includes the high mountain ranges of the Nilgiri and Annamallai Hills, which, except at the narrow funnel-shaped pass at Palghat, completely cut off the district from the Malabar country below the Western Ghats. "There is a wonderful difference in the climate and the fauna and flora of Malabar and Coimbatore. Even the people of the western side of the Ghats are a different order of beings in race, customs, and habits to those on the eastern side."

In Malabar the climate is of a humid nature and the vegetation luxuriant. The rainfall, chiefly contributed by the south-west monsoon, is on the average rarely below 100 inches in the year, and in many places it exceeds 150 inches in the year. The soil is a red laterite with sand and alluvium, and is naturally fertile. It affords a striking contrast to the dry and barren-looking plains of Coimbatore on the eastern side of the Ghats. The perennial moisture of this region on the western coast, though favourable to a profusion of vegetation, is inimical to many forms of animal life. The horned cattle are stunted, and sheep do not thrive at all, whilst the human race is held in check in many parts of the district by the terrible malaria engendered in so much moisture and excess of vegetation. "Epidemic smallpox pursues its ravages with a virulence unknown in the drier regions of the Carnatic, and cholera, when it does invade the tract of the western coast, becomes a dire pestilence in the land."

The mountain barrier between Malabar and Coimbatore intercepts the south-west monsoon rainfall, and Coimbatore, immediately under the Ghats on the east, is particularly deficient in rain during the south-west monsoon, the little it gets during this season being in the form of stray showers when the winds are variable. The chief rainfall of Coimbatore "occurs during the north-east monsoon, when the rain-clouds are kept back by the mountain barrier to the westward." It is consequently, from its position, for the most part a dry and barren district. Cultivation is largely carried on by well-irrigation, but the red and black soils are poor and thin, and trees, except under the hills, are scarce and stunted. The average rainfall at Coimbatore is less than 20 inches in the year, and the well-water, which is generally hard, and contains nitrates of lime and magnesia in excess, is at a great depth through disintegrating gneiss or schistose rocks.

The districts of Bellary, Kurnool, and Cuddapah, contiguous to Bombay and Haidarabad territories, have a remarkable feature in common, namely, their great undulating plains of black cotton soil, which varies in depth from 1 to 10 or 15 feet, and rests upon decomposing gneiss or granite, the felspar of which has disintegrated into an impure kaolin. This soil is continuous over great areas which are but thinly inhabited, the population of Bellary being no more than 151 to the square mile, and after heavy rain it fills like a sponge, and it then becomes impossible to walk or ride upon it without sinking deep into its adhesive surface. In dry weather the soil desiccates, contracts, and large fissures open out in it, many of them to a great depth. The period of the drying up of the soil after the seasonal rains is always marked by an accession of malarious fevers. During the rainy season much of the water of the surface drainage, which does not flow off in floods, falls into shallow pools and tanks, which are a good deal resorted to by the poorer people. The well-water of these districts is precarious in quantity, as the wells sunk in rock, or decomposed rock, often fail in the dry weather. The whole country, with the exception of the immediate neighbourhood of village sites and public roads, is singularly bare of trees. The same description of soil as in the "Ceded Districts" occurs also in Bandelkhand and Nagpur. (The foregoing particulars are taken from the Madras "Sanitary Administration Report" for the year 1872, by Dr. W. R. Cornish, F.R.C.S.)

1863.—From the records of the incidence of the disease among the troops and jails, the cholera of this year in the Southern Peninsula would appear to have been confined mainly to the areas south of the Kistna River. During the months of January, February, and March the disease was prevalent mostly in the southern districts, and in May, June, and July in the northern districts; but during October, November, and December it prevailed with renewed activity in both the southern and northern districts of the province.

Compared with the preceding year, the cholera of 1863, judging from the number of military stations and jails recording the disease, was less widely prevalent, but the mortality was greater and the intensity of the disease generally more severe, especially in the jails. Regarding the prevalence of the disease among the civil populations no information is available.

1864.—In this year cholera was very prevalent on the western coast both in the spring and autumn months. There were severe outbreaks of the disease in Cochin both in February and in September, and in the Malabar district 9535 seizures, with 7118 deaths, were reported from this cause, whilst in Calicut alone the number of deaths attributed to cholera was 370. The hilly districts of Wynaad, Coorg, and Mysore were also overrun by

cholera in this year, and the disease was active also in Coimbatore during its early months. All the southern districts of Madras and the Deccan plateau generally were visited more or less severely by cholera during some part or other of this year. In Madras itself, the cholera deaths of the year amounted to 574, and there was some considerable prevalence of the disease in the Vizagapatam district, but the districts of Kistna and Godavari appear to have remained absolutely exempt throughout the year.

During the first three months of the year the greater portion of the peninsula south of the Kistna River was more or less widely affected by cholera, and more especially the southern districts. In April and May the disease became more prominently active in the districts of the western coast, on the Mysore plateau, and in the northern districts generally. In May there was a severe outbreak of cholera in the Madura jail in the southern division, and another in the same jail in September. In Madras itself, where the disease had been prevalent during January, February, and March, there was a renewed activity of cholera in August, when the Native troops and the prisoners in the Penitentiary suffered severely. In September and October cholera reappeared with marked activity on the Malabar coast, and there were sharp outbreaks of the disease at Cochin and Mangalore. Compared with the prevalence of the disease in the preceding year, the cholera of 1864, judging from the incidence among the troops and jails, appears to have been markedly on the increase.

The principal feature of the meteorology of 1864 in the Madras Province was the almost entire absence of the south-west, or hot weather, monsoon rains, and a widespread drought in consequence. Large areas of land were left uncultivated owing to want of rain, and there is no doubt that the prices for food ruled high, and that considerable privation and distress pressed upon the poorer classes.

1865.—In this year cholera prevailed with epidemic violence during April and May in the Deccan districts of Haidarabad, and in those of Ahmednagar, Poona, and Sholapur of the Bombay Province. A Native regiment marching from Madras to Haidarabad was struck by cholera in the Nellore district in February, and during that month and March the disease was active throughout Mysore and the Bellary district. In the western coast districts cholera was rife "all through the cold dry months of the beginning of the year, and attained its greatest intensity in June and July." In Malabar 40,000 of the inhabitants died of the disease, and at Cochin there was a severe outbreak in the native town of Muttoncheri, and in the jail 19 prisoners out of the 40 were attacked. "Yet, while the pestilence was ravaging Cochin in this frightful manner, the prisoners at Ernacollum, in the native state of Cochin, about three miles across the backwater, though overcrowded and exposed to many insanitary conditions, never had a single case."

In South Kanara cholera prevailed in most parts of the district with some severity. The disease was generally diffused through Haidarabad, Kurnool, and Cuddapah to Nellore and the districts on the eastern coast. "In Nellore a terrible epidemic raged from March until October, and the prisoners in the jail suffered very severely all through March and April." At Guntoor the disease began in the district in April, and continued till the middle of August. In the Godavari, Vizagapatam, and Ganjam districts cholera was also very prevalent; at Coconada it was epidemic in June, and in the endemic area of Ganjam it was more than usually rife; at Berhampur and Chicacole the disease prevailed from May to December. In the Coimbatore

and Salem districts it was rife more or less throughout the year. Cholera struck Madras in August, and was generally diffused through Arcot, Tanjore, Trichinopoly, Madura, and Tinnevelly. In Madras itself the total cholera deaths of the year amounted to 944.

Among the troops and prisoners the cholera of this year was more prevalent during the south-west monsoon season than during any other part of the year. During the first four months of the year cholera was active in widely distant parts throughout the province from north to south. In January it appeared in Trichinopoly and Palamcottah in the south, and was active in Madras town during the same month. In February there was a severe outbreak at Secunderabad, and also one in the Madras town, and there were a few cases in Chittore. In March the activity of the disease increased in the Haidarabad and Presidency divisions, whilst cholera appeared in the Bellary district and the Mysore plateau. In April the disease continued prevalent over the same areas as in the preceding month. In May and the four following months cholera acquired very considerable increase, and overspread the whole province. On the western coast, which had apparently been previously free from the disease, cholera prevailed with violence during June, July, and August in all its extent. During the last three months of the year the disease seems to have subsided in the districts north of Madras, but in the districts to the south it was more active than during the preceding months of the year.

The principal fact recorded in regard to the meteorology of 1865 in the Madras Province is the almost entire absence of the south-west monsoon rains. A similar defect characterised the meteorology of the preceding year. The heat and drought thus prolonged over two years in succession produced a great scarcity of water, and large areas were left uncultivated. As a consequence, in many districts the prices of food ruled high, whilst in every district more or less scarcity was felt. Among the poorer classes there was considerable and widespread distress.

1866.—For the first time in this province the system of mortuary registration for the general population came into force in 1866, and for the first time we get a clear view of the course and progress of cholera in the several districts (see Table No. I.) The returns reveal a terrible destruction of life by cholera in this year, the total number of deaths registered under that name being 200,965, or at the rate of 8.94 per mille of the population under registration; and at the rate of 33.32 per cent. of the total number of deaths registered from all causes, or, in other words, the deaths attributed to cholera amounted to one-third of the whole number of deaths registered in this year.

The cholera of 1866 was extremely prevalent during the early months of the year in the Ganjam district, in the extreme north of the province, and in the southern districts of South Arcot, Tanjore, Trichinopoly, and Madura; it was also rife in the districts between them and the western coast. With the arrival of the south-west monsoon there was a marked increase in the prevalence of cholera in almost all the districts, especially in those which, from their geographical position, come within the direct influence of the monsoon rains. These rains, though late in arrival, were generally abundant; but before their advent the heat and drought were intense all over Southern India. The monsoons of 1864 and 1865, as before noted, had generally failed, large tracts of land remained uncultivated, and the prices of food had in many parts gone up to famine rates. Owing to these causes general distress and impairment of vital power were most prevalent among the mass

of the people. At the close of 1866 cholera was still in great activity in Madras and the districts to the south, including Salem and Coimbatore, in all of which the disease was very rife in the beginning of the year. During the year the entire province, excepting only the Nilgiri district, was afflicted by the disease with unexampled severity; and the mortality appears to have been most severe in those districts which suffered most from the drought of the preceding two years, and the consequent general distress for food.

Referring to the peculiar and unusual atmospheric conditions to which the peninsula of India had been exposed during 1866, the Sanitary Commissioner for Madras, in his official report for that year, observes, p. 201—

"These have been chiefly, so far as we can judge from the one or two records which have been kept up, extreme and unusual heat and dryness of the air, with a very late rainy season. At the Madras Observatory a maximum temperature of 110.6° F. was recorded on May 28th, which the Government Astronomer remarks was the hottest and driest day on record at Madras. The wet-bulb thermometer read 35.8° F. below the standard at 4 P.M., and the quantity of moisture in the air was only 16 per cent. of that required to saturate the atmosphere and produce rain. The thermometer reached above 106° F. on six days during the half-month (May), the average maximum of past years being only 95° F. The greatest reading of a black bulb *in vacuo* was 155° F. on the 19th."

1867.—There was a very marked and sudden subsidence in the prevalence of cholera during this as compared with the experience of the preceding year, the death-rates being 1.49 to 8.94 respectively.

The Kistna district shows a continued prevalence of cholera, approaching in severity the epidemic of the preceding year, whilst the three districts above it (see Table No. I.) show a very complete subsidence of the disease. In Nellore the epidemic of 1866 continued through the cold months until April 1867, after which it suddenly declined, only single deaths being recorded in each of the monsoon months. In Cuddapah and Bellary the decline is most marked, the former recording only 323 cholera deaths in this, against 14,823 in the preceding year, and the latter showing an almost complete exemption, only 10 deaths being recorded against 22,833 respectively. In Kurnool also the decline is very notable, as also in Madras, North Arcot, the southern districts, and the western coast after the month of April, though in South Kanara there was a persistence of the disease throughout the year. In the districts of South Arcot, Tanjore, and Trichinopoly cholera continued active throughout the year, with a force approaching that of the preceding year, and, moreover, acquired a marked impetus during the months of the south-west monsoon.

A corresponding very remarkable decline is also observable in the prevalence of the cholera of 1867 among the troops and jails, and the reader is referred to the tabular statements Nos. III. and IV. at the head of this section. No such immunity from the disease had been experienced for many years in this province. The Sanitary Commissioner, Dr. J. L. Ranking, in his report for 1867, p. 91, observes—

"This immunity is doubtless traceable to some meteorological or telluric causes, which, in the present state of our knowledge, and in the absence of a sufficiently extended series of meteorological observations, it is not possible to define. Last year was one of a series of great deficiency of rainfall, and the subsoil waters had, as indicated by the general scarcity of water in even the deeper wells, which at one time threatened to constitute a serious calamity, sunk far below their ordinary levels. This condition of the subsoil may have had a bearing not only upon the prevalence of the disease now under consideration, but upon the public health generally, especially in relation to the prevalence of diseases of the miasmatic order, which, as shown under the head of the 'general populat[illegible]eat reduction in the year under review."

As regards the meteorology of the year, there are no statistics, except for the town of Madras itself. The district returns of the rainfall, however, show the drought of the two preceding years to have been still greater in this year. At the same time famine rates for food ruled during the year.

1868.—In this year there was a still further and great decline in the prevalence of cholera, the death-rate having sunk to 0.36. In this successive annual abatement in the Madras Province cholera has behaved in the same manner during the years 1866, 1867, and 1868 as it had done in the Bombay Province during the years 1865, 1866, and 1867. In each province the disease declined steadily from a year of maximum violence to the next of diminished severity, and to the third of subsidence to a minimum of prevalence.

In the Madras Province, during the first of this series of three years, cholera was very generally diffused through all the divisions of the province without any very marked prevalence or exemption in particular divisions. During the next year of the series, though it had greatly declined in prevalence in all the districts, the disease showed a tendency to linger in particular tracts of country, as in Kistna and in the districts to the south of Madras, as well as in the endemic area of Ganjam. During the third year, though again greatly declined from the activity of the preceding year in all the districts except Trichinopoly and Salem, cholera still showed a tendency to linger in particular tracts, as in the districts to the south of Madras and in Ganjam away to the north. In the southern districts the disease declined in prevalence during the later months of 1867 and 1868, and prevailed with increased activity during their earlier months.

The rainfall of this year was abundant as compared with that of the year before. There was also a very marked improvement in the prices of food.

1869.—In this year there was a very marked revival in the activity of cholera in all the divisions of the province excepting Malabar. Among the civil population the registered deaths from this cause rose to 23,082 from 8036 in the year before.

Compared with the returns for the preceding year, the cholera of 1869 shows a greater prevalence in the districts of Ganjam and Vizagapatam, in the north of the eastern coast, during the season of the south-west monsoon; a continued disappearance, almost complete, in the adjoining districts of Godavari and Kistna; and a very active reappearance in the districts of Nellore, Cuddapah, Bellary, and Kurnool, all of which were nearly completely exempt from the disease during the preceding year. In Bellary the disease did not appear before March, and in Nellore not until May; but in Cuddapah and Kurnool it appeared in January, and, increasing in prevalence, it acquired its maximum intensity in all these districts during the south-west monsoon season. In the Madras districts and the Madras town, cholera, which in the preceding year was at a minimum of prevalence, in this year reappeared in April, and gradually acquired increased prevalence, which was maintained to the close of the year. In the districts of both Arcots and Tanjore, cholera, which was epidemically prevalent during the first three or four months of the preceding year, and had subsided to a minimum of prevalence in its latter months, remained at a very low degree of prevalence during the early months of this year, and up to the time of the south-west monsoon season, when it increased rapidly and continued prevalent to the end of the year. In Trichinopoly the epidemic of the early part of 1868 does not appear to have revived until the end of 1869, when, in November and December, there was a sudden increase of the disease.

The same course of cholera is observable in all the other districts of the southern end of the peninsula. In all of them the cholera of 1869 shows a steady tendency to increased prevalence towards the end of the year.

In this alternate rise and fall in the prevalence of cholera in each year in these districts there appears to be a fixed relation to the phenomena of the north-east and south-west monsoons, to the influences of which this part of the peninsula is subject. "The hot and dry season of 1869 was noted all over Southern India for its high average temperature, prolonged in many places beyond the usual course of the season."

The rainfall of both monsoons was more abundant in this than in the preceding year, but the prices of food were somewhat higher.

1870.—The cholera of this year prevailed with more than double the intensity of that of the year before, and affected with violence fresh areas which were either entirely exempt from the disease or but comparatively little affected by it during the preceding year.

In the Ganjam and Vizagapatam districts, in which cholera was very rife during 1869, the prevalence of the disease declined in a very remarkable degree in 1870, though it was still present in nearly every month of the year, and showed a decided increase in prevalence during the season of the south-west monsoon from July to September.

In the Godavari and Kistna districts, which were exempted areas in 1869, cholera in this year prevailed with remarkable force, in the Godavari district especially; whilst Nellore and Cuddapah, which both suffered severely in the preceding year, were in 1870 affected to a comparatively very small degree. In the latter the disease was active only from May to October inclusive, whilst in the former the increased prevalence of the preceding December was continued all through the first three months of the following year, sunk to a minimum in April, and disappeared altogether in May. In June the disease reappeared in Nellore, though not in any great force, but it continued active until the end of the year.

In the Bellary and Kurnool districts, where cholera was more prevalent during 1869 than in any other part of the province, excepting only Tanjore, the returns show no sign of the existence of the disease in 1870. In Madras and Chingleput, where cholera prevailed during the latter half of the preceding year, the disease was still active in 1870, and acquired a marked accession of prevalence during the south-west monsoon season, after which it subsided to a minimum of prevalence at the end of the year. In North Arcot and Tanjore the high prevalence of the cholera of 1869 was continued with increased force throughout 1870, but with very marked differences in respect to the seasons of prevalence in the two areas. Thus, in North Arcot the epidemic of the later months of 1869 subsided suddenly in the early months of 1870; but in May the disease again acquired epidemic prevalence, and continuing active throughout the monsoon season, was still prevalent at the end of the year. In Tanjore, on the other hand, the epidemic of the later months of 1869 continued active throughout the early months of 1870, and suddenly falling in activity in March, continued at a declining prevalence, excepting only a slight increase in June and July, through the rest of the year.

In Trichinopoly, Madura, and Tinnevelly, and the districts intervening to the Malabar coast inclusive, the weak cholera prevalence of 1869 was followed in 1870 by a severe epidemic diffusion of the disease, which was most destructive in the districts of Tinnevelly, Madura, and Salem. In the Trichinopoly district, which is very extensively watered by irrigation channels,

the dry upland districts suffered from cholera much more severely than the lowland irrigated tracts, and apparently in proportion to the degree of moisture in the soil. The same fact was observed in regard to the district of Tanjore. In Tinnevelly the low-lying villages in places on river-banks suffered in a very marked degree more than those situated away from river-banks.

In November 1869 the Tinnevelly district was visited by a cyclone "discharging an unusual rainfall, which flooded the river valleys and tended to raise the level of the subsoil moisture greatly beyond its normal height." The average rainfall of this district in the north-east monsoon season (viz., October, November, and December) was 19.98 inches in 1866, 17.81 inches in 1867, and 15.95 inches in 1868; but in 1869 it was 26.44 inches, and most of this great rainfall occurred during the cyclone in November.

The incidence of cholera in 1870 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section. Much of the excessive cholera mortality among the civil population is attributed to the assemblage in this year of large bodies of pilgrims at religious fairs, and to the privations and hardships undergone in their journeyings to and fro. The Pulney festival in the Madura district, held from the 16th to the 25th of March, was attended by about 220,000 persons. Cholera, which had been prevalent in the district in January and February, broke out in virulent form amongst them; the pilgrims immediately began to disperse, and the disease spread in their tracks. At the fair itself 26 deaths were reported from the 16th to the 22d March. At the Chittore festival in May, when the town was enormously crowded, cholera also prevailed. At the Tirupati fair, from 5th to 11th May, cholera, which was already active in the place, 34 deaths being reported between the 3d and 5th May, broke out virulently among the pilgrims, who then rapidly dispersed. Many of them went direct to the Conjeveram fair in the Chingleput district, held from the 11th to the 20th May, and attended by about 30,000 persons. Cholera had appeared in the place on the 6th May, and a severe outbreak occurred among the pilgrims, 92 deaths being reported in the fair. At this period "the hot winds were unbearable," and blew chiefly from the S.W., veering occasionally to the N.W. On the 15th and 20th May slight rain fell, and on the 31st a pretty heavy shower.

Regarding the meteorology of the year, it is recorded that the earlier months of 1870 were dry, but that rain began to fall about the various districts in March, and that the south-west monsoon set in about its usual time, but instead of abating in September, continued to prevail until nearly the end of October. In Vizagapatam a cyclone and heavy rainfall occurred in October, but in Nellore and Madras the north-east monsoon was somewhat deficient. On the whole, the seasons were most favourable to agriculture; much land was brought under cultivation, and the prices of food-grains generally decreased. "The year 1870 will long be remembered as a generally prosperous season in Southern India."

Regarding the food-supply it is recorded—"There was a considerable fall in the prices of grain, especially during the latter months of the year, owing to the abundant harvest, especially of the dry cereals, which depend so much on the amount and timely occurrence of rainfall."

1871.—Compared with the preceding year, there was a very great decline in the prevalence of cholera in 1871 in all the districts, except those of Nellore, Bellary, Cuddapah, and South Kanara. This subsidence is very marked in the Godavari district, where during the preceding year cholera

was mainly confined to the Ellore circle of registration, which is remarkable for the nearness of the subsoil-water to the surface. In the Kistna district the disease, which had completely disappeared towards the close of the preceding year, starting into fresh activity, again reappeared in the beginning of this year, and continued to prevail throughout its months with a force a little more than half that experienced in the year before. The districts of Nellore and Cuddapah, the former especially, show a strong revival of the disease, whilst Bellary, which in the year before was wholly exempt from cholera, now shows only a weak and intermitting activity at long intervals. The Kurnool district, with the exception of a small local outbreak in January of the preceding year, remained exempt from cholera in both years, but in North Arcot the disease was nearly equally active and fatal during the same period throughout. In the town of Madras cholera was nearly as generally present in both years, but there was a marked decline in the total mortality from it in the latter year. In all the other districts the cholera of 1871 was generally active throughout the year, but in a much less degree than in 1870, except in South Kanara, where the mortality was about double that of the year before. In all these districts the earlier months of the year exhibit a greater activity of the disease than the later months. In Malabar cholera almost disappeared in the south-west monsoon season.

Among the Native troops and the jail populations there was a similar abatement in the prevalence of cholera during 1871; but among the European troops the total mortality from this cause was greatly increased by a severe outbreak of the disease among those quartered at Secunderabad.

Regarding this outbreak the following particulars are recorded. The outbreak at Secunderabad began on the night of the 24th May 1871 in H.M.'s 18th Hussars, and within twenty-six hours there were struck down 34 men and 1 child out of a strength of 385 men, 56 women, and 108 children; and during the ten days of the outbreak a total of 85 persons were attacked, of whom 39 died. Of these cases 63 occurred during the first three days, 5 cases occurred on the fourth day, 10 on the fifth, 3 on the sixth, 3 on the seventh, none on the eighth and ninth, and a single case on the tenth day.

"During this period the two European infantry regiments and artillery at Trimulgherry and the numerous European families in the cantonment never had a case." The inhabitants of the bazar and the Native infantry lines, and the surrounding villages, however, suffered to some extent, "but in no degree in proportion to the Hussars, upon which corps the disease fastened with a strange malignancy."

Prior to this outbreak among the 18th Hussars no cholera had been reported anywhere in the neighbourhood, but on the 20th May three fatal cases of purging and vomiting, which "were seen by the dispensary dresser, who suspected them to be cholera," occurred in a party of travellers (who had arrived apparently in good health on the 18th May, and were not seized with cholera till the 20th) in the vicinity of "James's bazar," the most densely populated part of Secunderabad. About the same time some deaths had occurred in the bazar from diarrhœa, and on the 20th May the cantonment magistrate applied to the Deputy Inspector-General of Hospitals for some astringent pills for distribution to the different police-stations. During May single deaths from "diarrhœa" in the Secunderabad bazar were entered in the cantonment register of deaths on the 3d, 4th, 5th, and 6th, on the 19th and 22d, and 4 deaths from diarrhœa were entered on the 20th of the month.

On the 21st May a death from cholera was reported as having occurred on that day in the village of Chhota Malkapur, and on the 22d the wife of a sepoy in the "Tarband Lines" was seized with diarrhœa, which, on the 24th, lapsed into genuine cholera. On the 23d May two cart-drivers, who had come from Masulipatam, were found "labouring under unmistakable symptoms of cholera" just beyond the village of Chikulgoodam, which lies within half a mile of the Hussar barracks and hospital, somewhat to the south and east. Their party, it was ascertained from the assembled cart-drivers, had been attacked by the disease on the way near the River Kistna, and had lost several of their number.

On the morning of the 24th May, being the Queen's birthday, the whole of the troops in garrison, European and Native, appeared on the general parade-ground. "The morning was said to have been tolerably cool, and, indeed, up to this time there had been very little of really hot weather, such as is seasonable in the Deccan in the month of May." Two European officials, spectators of the birthday parade, were, it is stated, seized with sudden and unaccountable diarrhœa while on the ground, and in the course of the day and evening of the 24th May "there occurred five cholera seizures and two deaths in the Secunderabad bazar."

"The day of the 24th May is said to have been very close and sultry. . . . The maximum heat registered was 106°, and the minimum 79°. Clouds, thunder and lightning, dust-storms, rain, and sometimes hail, are common in the Deccan just prior to the setting in of the south-west monsoon, but there had been no rain in the station since the 3d May, when 0.14 inch was registered." From the 3d to the 24th the wind blew strongly from the north-west, and on the 26th it "changed round to the south, and became variable until the setting in of the south-west monsoon, which broke on the 10th June, accompanied, however, by but a very slight rainfall." The meteorological phenomena registered at Secunderabad during the month of May 1871 give the following results:—Monthly means—Reduced barometer, 27.975°. Thermometer: mean maximum, 101.9°; mean minimum, 77.7°; mean daily range, 24.2°; mean daily humidity, 46. Wind, W. by N. Rain, 0.14 inch. Weather—before 10 A.M., fine; 10 A.M. to 4 P.M., overcast; 4 P.M. to 10 P.M., usually fine. On the 2d the evening was overcast, with moderate thunder and lightning. On the 12th overcast, with distant thunder about midnight. On the 19th cloudy; shower at 8 P.M. On the 20th overcast, cloudy; distant thunder at 10½ P.M. On the 24th overcast day, and on the 28th cloudy day, moderate thunder and lightning.

The Queen's birthday was kept a holiday, and it is possible some of the men may have visited the Chikulgoodam village, or used the palm-toddy collected in it. There was no evidence, however, on this point. But it is clearly stated "there was no extra-consumption of liquor from the canteen, and no drunkenness in the regiment on that day."

The bazar, as already stated, was affected prior to the outbreak in the regiment. On the 25th there were 6 fresh cases among the natives of the cantonment, and on the 26th and 27th respectively 12 and 13 new attacks were reported. The disease gradually extended to the villages and bazars in the neighbourhood, and appeared in the city of Haidarabad, five miles distant, on the 6th June. The cantonment bazar and villages continued to suffer for several weeks, and up to the 23d July, out of a population of between 40,000 and 50,000 persons, 252 cases and 117 deaths had been reported.

On the 25th June, in the Trimulgherry barracks, two artillerymen were attacked and died. Two other cases occurred subsequently, one in H.M.'s 2-24th Regiment and one in H.M.'s 76th Regiment.

In less than twenty-six hours after the commencement of the outbreak on the 24th May the 18th Hussars (officers, 17; men, 349; women, 48; children, 82) moved into camp on an open plain at Nagaram, nine miles north-east of Secunderabad, and was accompanied by about 1200 native servants and followers. Out of this large number "only one individual was attacked by cholera, viz., one of the hospital coolies, who recovered."

Regarding the meteorology of the year 1871, statistics of the rainfall alone are available. The rainfall generally in January, during the termination of the north-east monsoon, was more abundant than usual. This was due in a great measure to a cyclone which was noticed on the western coast. In this month rather heavy rain was registered in the districts of Malabar, South Kanara, Tinnevelly, and Madura; and in consequence of heavy rains at this season on the Western Ghats, adjacent to these districts, freshes came down the Rivers Kistna and Godavari. The spring rains, though late in some districts, were generally abundant, and the south-west monsoon, except over a limited tract of country, "was the most bountiful downpour that has been recorded for many years past." On the western coast itself the rainfall was considerably in excess of the average, and a similar phenomenon was observed in the coast stations in British Burma; but there was a tract of country, extending from the Western Ghats across the peninsula, "and including amongst others the districts of Kurnool, Haidarabad, Vizagapatam, and Ganjam, in which the south-west monsoon rains more or less

failed." In Sholapur and some parts of the Haidarabad country all cultivation was at a standstill owing to the scarcity of rain, "and large quantities of grain had to be imported from South and North India to meet the deficient out-turn of crops."

In Ganjam and Vizagapatam districts the deficiencies of the south-west monsoon "were not made good by the rainfall of the north-east monsoon, which almost entirely failed in those districts, causing a very general loss of the rice-crop." Large quantities of grain had to be imported from other districts, and though no actual famine threatened, special relief works were started by Government to find employment for the poorer classes of agriculturists, whose fields had long remained uncultivated for want of rain. In March of the following year, 1872, epidemic cholera broke out in these districts, and caused much loss to the population.

On the coast districts south of the Kistna the north-east monsoon was more abundant in rainfall than usual. The monsoon broke at Madras on the 17th October, and it gave a good rainfall over the districts of Chingleput, South Arcot, Trichinopoly, and Tanjore. The last district suffered from a heavy gale on the night of the 7th November. "The influence of this storm was felt on the western coast, heavy rain having fallen at the various stations in the Malabar district, an average of nearly nine inches of rain having fallen in what is usually a month of minimum rainfall on the western coast." On this occasion the Coimbatore district also experienced a heavy fall of rain. "Very little of the north-east monsoon rain fell in the Kurnool district, nor did it extend in any quantity to the Mysore country."

Regarding the prices of food, it is stated that the copious rains of the season of 1870 had a decided influence in cheapening the food-grains of the country throughout the year 1871; but, owing to the failure of rains in the Haidarabad country and the famine in Persia, there had been a large exportation of grain from the southern provinces of India and from the western coast districts, and this demand for grain from other parts of the country had, in a measure, tended to prevent prices falling so low as the actual productiveness of the season would have indicated.

1872.—There was a continued decline in the prevalence of cholera in this year, the total number of deaths registered from that cause among the civil population having fallen to 13,262 from 17,656 in the year before. Of the former number, 7328 males and 5919 females were distinguished, against 9648 and 8008 respectively of the latter.

The local prevalence of cholera in 1872, compared with that of 1871, deserves attention in connection with the prevalence of the disease in previous years. In Ganjam district the great epidemic cholera of 1866 gave a total of 24,929 deaths; in 1867 the number fell to 548, and in 1868 to 207. In 1869 the deaths rose to 1033, and again fell in the succeeding years, 1870 and 1871, to 382 and 96 respectively. In 1872 the deaths again ros as in the two preceding triennial periods, the total being 3441. In th adjoining district, Vizagapatam, precisely the same periodical rise and fall observed. The following are the figures for the several years:—

1866 . 11,695	1867 . . 145	1868 . . 121	1872 . . 5263
1869 . . 638	1870 . . 259	1871 . . 53	

A similar coincidence is not observed in any of the other districts. In the early part of 1871 Ganjam was suffering severely from drought, the monsoon rains of the preceding year having failed, and with them the rice-crops and

forage and the usual sources of water-supply. In 1872 rain fell in May, and the south-west monsoon was more abundant than usual in its rainfall. Cholera commenced activity in March, and attained its maximum intensity in May. In Vizagapatam cholera, after complete disappearance for seven months, reappeared in April, during which month 16 deaths were reported in seven villages. This was the season of southerly winds, and they are said to have been unusually hot and moist in May 1872. In June the south-west monsoon set in "with unusual violence, much of the country being flooded from excessive rain." Cholera prevailed in maximum intensity during June, July, and August.

In the Godavari district, adjoining Vizagapatam, no similar annual sequence in the rise and fall of cholera is observable. For the first three years, 1866 to 1868, the total annual deaths registered are 16,272, 575, and 9 respectively; but in the next three years, 1869 to 1871, they are none, 13,305, and 202 respectively. In 1870 the disease began in April, after an entire absence from the district since March 1868, a period of twenty-five months, and rapidly rose to its intensity of prevalence in the months of June, July, and August, during which the rains of the south-west monsoon fell in unusual abundance. In the Kistna district a very similar course in the prevalence of cholera during the series of years from 1866 is observable; but no corresponding features are traceable in the progress of the disease in the other districts of this province.

The cholera epidemic of 1871 in Nellore and Cuddapah had completely subsided towards the latter part of that year, and, with the exception of a very slight prevalence in Nellore, the two districts were practically free from cholera throughout 1872. Bellary also in this year, as in 1870, remained completely exempt from the disease; whilst Kurnool, with the exception of a local outbreak in January 1871, preserved an entire immunity from the disease during the whole of 1870 and 1871, and up to September 1872, when the reappearance of cholera was marked by 3 deaths registered in that month. These were followed by 53 deaths in October and 73 in November, and then the disease again disappeared throughout December.

In the Madras district (Chingleput) the epidemic of the preceding year disappeared in February 1872, and with the exception of 37 deaths registered in the months of April, May, and June, showed no signs of its presence during the rest of the year. In the Madras town only 5 deaths were registered from cholera during 1872, "a circumstance unprecedented in the history of the town since death registration was introduced in the year 1855."

In North Arcot the cold weather epidemic, which increased in prevalence during the last two months of 1871, continued active during the first three months of 1872, and then suddenly subsiding, lingered on until August, when the disease disappeared from the district. In South Arcot cholera was active throughout 1872, as in the year before, but to no great degree. In both years the disease in this district increased markedly during the early months of each. In all the other districts there was a very distinct decline in the prevalence of cholera during 1872. Tanjore and Coimbatore showed the disease rapidly disappearing, Tinnevelly and South Kanara remained completely exempt all through the year, whilst in Malabar it appeared in very mild prevalence. Among the troops and jails the cholera of 1872 was as little prevalent as among the civil population.

The most remarkable feature of the meteorology of the year 1872 was the occurrence of a cyclone on the 1st and 2d May, and a very heavy rain-

fall in many of the southern districts along the eastern coast. The cyclone did much damage to shipping, and the rainfall inland caused the destruction of many tanks. The rainfall was particularly heavy in the Vellore district, and, "judging from the rainfall returns, the effects of the cyclone were felt in every district of the province, except in the northern coast districts above Nellore."

The south-west monsoon broke in June, and was unusually heavy in the northern and western coast districts, and the rainfall continued to be general and above the average until October. The north-east monsoon was late but copious, and continued all through November and December. The rainfall of 1872 was considerably in excess of that of the two preceding years, and both 1870 and 1871 were years of more than average abundance of rain. In this year of excessive rainfall there was "an increased mortality from fevers in many districts, a general distribution of smallpox, and a general absence of epidemic cholera."

Regarding food-supply, it is recorded that in Ganjam and Vizagapatam districts the prices of food-grains were ruling very high in the beginning of the year, "consequent on the failure of the monsoons of 1871; but after a plentiful supply of rain and good crops prices fell considerably." Meanwhile the districts suffered heavily from epidemic cholera. In Godavari district, one of the "chief exporting districts of grain, prices began to rise about April and May, when the neighbouring districts were importing largely, but fell again in October, when the prospects of the new crops were assured." Cholera appeared in the district in June, and prevailed epidemically till October. In the Kistna district grain appears to have been unusually dear, possibly due to exportation to the Haidarabad country. There was slight cholera in this district during the months of January, August, September, and October.

In the South of India generally the long-continued rains of the north-east monsoon "had the effect of sending up prices towards the end of the year, as it was feared that the standing crops would suffer." The real food-staples of the labouring classes of this province are *Sorghum vulgare* (cholam) and *Eleusine coracana* (raggy). These grains are generally grown as dry crops without artificial irrigation, and the yield naturally depends upon the favourable or unfavourable character of the seasons.

The consumption of salted fish is very large in this province, but, owing to the high price of salt, a large amount is imperfectly cured. "The flesh and fish eating population of the peninsula of India number probably ten to one of the so-called vegetarian castes."

1873.—The returns for this year show a complete exemption from cholera in more than half the number of districts in this province, and a mere presence or but very mild prevalence of the disease in all the others. Compared with the experience of the preceding years, cholera may be said to have practically disappeared from the Madras Province in 1873. With the exception of a very slight prevalence of the disease in the northern endemic area of Ganjam, and in the southern endemic areas of the southern part of the province, and of a strictly local epidemic in the Nellore district, there were only a few sporadic deaths registered from cholera during this year.

The epidemic in Nellore was evidently a continuation of the outbreak which commenced in the preceding November. It subsided in March 1873, and was confined to only three rural circles of registration, situated to the north and west of Nellore town, in which it affected 49 villages. The total

cholera deaths in this district were 497, or more than half the entire cholera mortality registered throughout the province during the year. The remaining deaths were mostly isolated cases of "sporadic" cholera, an endemic form of the disease, which differs from the epidemic form only in not spreading generally among the people.

Of the 21 districts of the province, no less than 11 show a complete exemption from cholera in this year. The town of Madras, in which for many years hardly ever a week passed without deaths being recorded from this disease, has been singularly free from cholera during the last two years, only 5 deaths being registered from this cause in 1872 and 6 in 1873. This absence of cholera from Madras in the two years since the new water-supply has been available is a noteworthy coincidence, the town, in common with almost the whole of Southern India, having enjoyed a remarkable immunity from the disease during the years 1872 and 1873. Moreover, "although the new source of supply is available for large sections of the population, it is quite certain that many of the people still draw their water from the old sources;" and, indeed, at this time "one complete municipal division of the town, with 65,547 inhabitants, and sections of some other divisions, have had no water brought to them. And again, the Fort, the Penitentiary, and the General Hospital are still supplied from the "seven wells," and these localities (which are not included in the death returns for the civil population) "have been just as free of cholera as those supplied with the new water."

In the large Native state of Mysore, with a population of 5,000,000, there was no death registered from cholera in this year, nor in the Native states of Cochin and Travancore, whilst in Ceylon only 14 cholera deaths, mostly isolated cases, were registered. Among the troops and jails a like immunity was enjoyed. The rainfall of this year was somewhat peculiar.

"The western, midland, and northern districts of the Madras Province derive their principal rain from the south-west monsoon, while the southern and eastern coast districts, known as the Carnatic, are watered chiefly by the north-east monsoon rains. The season of the south-west monsoon extends from June to October, and of the north-east monsoon from October until February or March; but it rarely happens that any heavy rainfall occurs in the Carnatic after the month of December. January, February, and March are usually clear dry months in all parts of the province. In April and May showers of rain fall in many districts, and this season of the year, which marks the change of the monsoons, is not unfrequently characterised by violent cyclonic storms. The heaviest rainfall of the province is in the western coast districts, where the average rainfall is over 100 inches, and in some parts nearer 200 inches. The districts immediately to the east of the western mountains are generally dry and rainless during the south-west monsoon, but get their share of the north-east rains late in the year. The rainfall of the north-east monsoon is heaviest along the coast-line, from the Nellore district southwards, and in some seasons, as in 1873, it hardly extends at all inland to the districts of North Arcot, Cuddapah, Bellary, and Kurnool. In some years a large amount of the rain of the north-east monsoon falls out at sea in the Bay of Bengal, and is lost to the eastern and southern districts of the peninsula."

In 1873 the south-west monsoon rains, though setting in at the usual time on the western coast, were very much later than ordinary in the midland and northern districts, which consequently received considerably less than their usual share of these rains. These are the districts which show so marked an absence of cholera in 1873. The end of the south-west monsoon in October gave heavy rain in all parts of the country, but the north-east rains from the end of October were not so heavy as usual, and in some districts, as in Trichinopoly and Tinnevelly, failed almost entirely. These, in common with all the other southern districts, also show a remarkable

immunity from cholera in 1873. "The peculiarities of the seasons in 1873 in Southern India seem to have been—(1.) heavy rainfall in February over most of the districts; (2.) a late south-west monsoon, with heavier rainfall than usual in October; and (3.) a scanty north-east monsoon, with deficient rainfall, in the districts removed from the eastern coast-line."

Regarding the food-supply, it is stated that the average price of rice varied in the different districts from 24½ sers the rupee in Ganjam to 13 sers in Tinnevelly, and in most districts was rather dearer in the end of the year than in the beginning. The price of the dry cereals cholam and raggy had generally advanced at the end of the year in a higher ratio than rice; and this is the more important "because four-fifths of the poorer classes of this province depend upon the dry cereals, and not on rice, for their nutriment."

1874.—This, again, was a year of remarkable immunity from cholera throughout the province. The returns show a complete absence of the disease from all the districts, except Ganjam in the north, South Arcot and Tanjore in the south, and the western coast. In the districts of South Arcot and Tanjore the disease has evinced a more steady persistence than in any other part of this province, not even excepting Ganjam, which has shown a very similar tendency to localise the activity of cholera. In South Arcot cholera has never been absent for a single month since the great epidemic of 1870, though the disease has year by year steadily declined to the minimum prevalence of the year under notice, as is shown by the total annual deaths given in the following years:—

1870 . . 3248 | 1871 . . 734 | 1872 . . 758 | 1873 . . 50 | 1874 . . 19

In Tanjore cholera completely disappeared during the last five months of 1872, with the exception of two deaths attributed to the disease in the month of September of that year. Otherwise this district shows a steady persistence, though at a declining rate of prevalence, of the disease similar to that observed in South Arcot. In Ganjam, after subsiding to a minimum of prevalence in 1871, cholera reappeared with epidemic violence in 1872, subsided considerably in 1873, and again rose somewhat in prevalence in 1874 (see Table No. I.) The returns show a distinct tendency of the disease to permanency in all these districts.

The troops and jails experienced a like happy immunity from cholera in this year.

Regarding the rainfall of the year, it is observed that the amount of rain which fell in 1874 exceeded the average in almost every district.

In respect to food-supply, there was no scarcity or dearness in this year, though the prices of all the food-grains were higher than in the year before.

1875.—Cholera prevailed with epidemic force in most parts of the province in this year, a total of 94,546 deaths from it being registered among the civil population, including 111 deaths among the European and Eurasian communities. The European population under registration in this province is given as—males, 5018; females, 2583; total, 7601; and the Eurasian as —males, 7940; females, 8639; total, 16,579.

The returns show that the cholera epidemic of 1875 commenced in the district of Tanjore in the month of April, and rapidly acquiring force, became spread generally over most parts of the province by the month of August, and that the disease was still actively prevalent at the end of the year in all the districts excepting Vizagapatam (which preserved a complete immunity

from the disease throughout the year), Godavari, and to some extent Kistna also, in the north of the east coast, and South Kanara on the west coast.

Prior to the commencement of the epidemic in Tanjore cholera was active in the island of Ceylon, where the disease appears to have attained its maximum intensity in March. The following tabular statement exhibits by months the deaths registered from cholera at three principal places in the island during 1875 :—

Stations.	Cholera Deaths Registered in the Months of 1875 in Ceylon.												Total.
	Jan.	Feb	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Colombo . . .	16	57	194	45	9	75	10	9	2	...	...	18	435
Galle	...	1	48	40	23	...	...	...	...	...	1	...	113
Ceylon . . .	16	70	281	102	73	174	203	192	314	100	63	229	1817
Total . .	32	128	523	187	105	249	213	201	316	100	64	247	2365

It would thus appear that the cholera of 1875 really commenced in the extreme south, and gradually advancing northward, by the time of the south-west monsoon was in epidemic prevalence in Tanjore and Trichinopoly and the adjoining southern districts of the province, whence, during the continuance of the south-west monsoon, the disease spread over the greater portion of the peninsula. In August the disease appeared in the Nilgiri Hills, 3 deaths being registered in that month, 1 in October, and 8 in December.

In connection with the almost complete exemption of the districts of Kistna, Godavari, and Vizagapatam, it is worthy of note that cholera, the disease being epidemically prevalent in all the other eastern coast districts throughout the period from August to the end of the year, did not appear epidemically in Ganjam, a natural endemic area, until the month of November.

In the Mysore state cholera first appeared in July, and rapidly assumed the epidemic form. In November deaths from the disease were reported from every district. The total number of cholera deaths registered in this state amounted to 3220, and the highest mortality of any month, 1029 deaths, was registered in September. Coorg almost entirely escaped the disease, only 5 deaths, viz., 1 in April and 4 in October, being registered under cholera in this little state throughout the year.

The peculiar feature in the meteorology of this year was the deficiency of rainfall throughout the province, the total average being only 39.38 inches. In the year before it was 52.82 inches, and in the year before that, 42.78 inches, and in the year before again, 56.95 inches.

The prices of food, though beginning to rise in many districts, were, on the whole, much the same as in the preceding year.

1876.—Cholera continued widely epidemic and with considerably greater force than in the preceding year. The number of deaths registered among the civil population rose to 148,193 from 94,546 in the year before, giving a death-rate of 5.08 per mille of population against 3.12 respectively.

The cholera of this year was a continuation of the epidemic which started into activity in this province in the month of April of the preceding year. That epidemic, as already stated, commenced in the district of Tanjore in April, and steadily increasing in prevalence, attained its hot-weather mon-

soon season intensity in July. The prevalence of the disease then alternately fell and rose slightly during the succeeding months of the south-west monsoon until its close in October, and after that continued steadily rising with the advent of the north-east monsoon, until it reached its cold-weather maximum at the close of that year.

The year 1876 commenced with the cholera epidemic of the preceding year steadily subsiding, and this subsidence continued until March, when the disease sunk to its minimum spring prevalence. In April cholera resumed its activity, and continued steadily increasing in prevalence until July, when it attained its hot-weather rainy season maximum of intensity. After this the disease suddenly and rapidly subsided to the autumn minimum of prevalence in October, and then, with the setting in of the cold-weather monsoon rains, started into fresh activity, and rose to a high maximum of intensity at the close of the year (see Table No. II.) This seasonal rise and fall in the prevalence of cholera—to a maximum at the periods of the summer and winter solstices, and to a minimum at the periods of the spring and autumn equinoxes—is a very remarkable phenomenon, the constant and regular recurrence of which is more or less clearly observed in all parts of India in which cholera is a constant or habitual visitor. In the Madras Province the regularity of this seasonal rise and fall is well illustrated by the monthly figures in Table II., given at the outset of this annual historical summary.

The returns of cholera deaths in 1876, compared with the returns for the preceding year, show an enormous increase in the prevalence of the disease in the districts of Ganjam, Vizagapatam, and Godavari; also in Salem, South Kanara, and Malabar; but in Coimbatore the mortality was a little less than one-third that of 1875. In Tanjore also, where the epidemic first made its start in the year before, the deaths in 1876 were less than half the number registered in that year. In South Arcot the disease still prevailed, with a slight increase over the mortality of the preceding year; but in North Arcot the mortality considerably more than doubled that of the year before. In Kurnool and Bellary the cholera mortality in 1876 was more than 13, and 7 times greater respectively than in 1875. In both Nellore and Cuddapah the mortality was considerably more than double that of the year before. On the other hand, in Madura the cholera mortality in 1876 sank to less than a fourth of what it was in the preceding year, and in Trichinopoly the decline in cholera prevalence was also very marked, whilst in Tinnevelly there is little difference in the mortality of the two years. In Malabar the mortality was more than treble that of 1875, and in Ganjam, at the opposite extreme of the province, it was eleven times greater. In Vizagapatam, a district which was entirely free of cholera in 1875, there were 1273 deaths in 1876; in Godavari there were 6977 deaths in 1876 against only 12 in the year before, and in Kistna 6727 against 40 respectively.

In connection with the incidence of the cholera of this year among the European troops, it is recorded that 13 cases of the disease occurred at Wellington, a station on the Nilgiri Hills, 6000 feet above the level of the sea. The outbreak at Wellington, Dr. Cornish, the Sanitary Commissioner for Madras, writes—

"Was almost entirely confined to an infected party, which reached the station on the 1st April, having cholera in their midst. It seems that some convalescents of H.M.'s 33d Regiment from Bombay, with details from Secunderabad and Bellary, met at the Arconum railway station on the 30th March, and proceeded together in the train to Metapolliam. On the way, and in the railway carriage, two men of the Bombay party were seized by cholera, and one of these died in a cart on his way to Wellington, the other man being

carried into the cholera camp provided by the local authorities for the reception of the infected party. On the following day three men and a child were seized. Up to the 7th April there were eleven admissions from this party. These people were not allowed into barracks until the 20th May."

Before this, however (as is elsewhere stated in the report for 1876), in the third week in April a case of malignant cholera occurred in a woman in No. 4 married soldiers' block, and on the 14th May a soldier engaged in looking after the sanitation of the cantonment was admitted with severe cholera symptoms. He recovered. This was the last case of the disease observed in Wellington. Cholera had appeared in the Nilgiri district as early as March 9, deaths from the disease having been registered among the civil population in that month. In this district altogether 25 deaths from cholera were registered during the year. They all occurred in one village out of the 22 under registration in this district.

The year 1876 was one of excessive drought throughout the province, the average rainfall of the year amounting to no more than 30.18 inches, the smallest fall recorded in any year since 1863, the next smallest fall being that of 1867, when it was 36.62 inches. The deficiency in the rainfall of 1876 was noticeable in every district of Southern India, but in the districts of Bellary, Kurnool, Cuddapah, Nellore, and Chingleput the deficiency was more marked than in the others. In all these districts there was as a consequence a very general failure of the dry crops, and "before the end of the year the food scarcity had risen to the proportions of famine."

Even on the western coast the south-west monsoon rains were much lighter than usual, and the north-east monsoon, which usually brings copious rains to the districts along the eastern coast, was almost a total failure. In the Nellore district, in which the average fall for October, November, and December is about 20 inches, less than 2 inches fell in 1876. In Madras during the same three months, instead of 38 inches, the mean of the five years ending 1874, there fell only 6.45 inches. In Ganjam, Vizagapatam, and Godavari the deficiency is not so marked, and agricultural production was not hindered; but in Kistna only half the average amount of rain fell, and the dry parts of the district away from the influence of the canal irrigation suffered much. (See Table No. VI.)

In regard to food-supply, the staple grains *cholam* and *raggy*, which are the grains most commonly used by five-sixths of the people of Southern India (they are both varieties of millet), rapidly went up in price to famine rates. As an example of the rise in prices—In Bellary *cholam* (Sorghum vulgare) sold at 36 sers 6 chittacks the rupee in January 1875; the price rose steadily through the year until January 1876, when the price was 26.1 sers the rupee; in September of the same year the price rose to 15.5 sers the rupee, and in December to 7.5 sers the rupee, or 400 per cent. above its ordinary value in 1875 and former years. *Raggy* (Eleusine coracana) was sold in Bellary in January 1875 at an average rate of 35.4 sers the rupee; in December 1876 the price was 7.9 sers the rupee, or $4\frac{1}{2}$ times dearer than in December 1875. "The prices of all kinds of food besides grains and pulses went up alarmingly high towards the end of the year. Oil, ghee, ground-nuts, sugar, fowls, mutton, milk, butter, and vegetables have all undergone a corresponding rise. The only cheap food of an animal kind has been *beef*, and this has been cheap solely on account of the mortality amongst the cattle, and the deficient supplies of fodder to keep them alive." In fact, famine was abroad in the land.

1877.—There was an enormous increase in the prevalence of cholera in

this year throughout the province, which was also visited by severe and prolonged famine. The total number of deaths registered from cholera among the civil population amounted to 357,430, against 148,193 in the year before, and 94,546 in 1875, the year in which the epidemic commenced, the total of cholera deaths in the year before that being only 313. Although no direct relation between the prevalence of cholera in the population and the intensity of famine distress is traceable, there is ample evidence to show that the effects of this great and prolonged epidemic of the disease on the general population were greatly intensified by the condition of the people produced by drought and scarcity. The returns show very clearly that cholera has its fixed seasons of prevalence and subsidence independently of the presence of famine, but also that famine greatly aggravates the severity of its fatality.

This seasonal rise and fall in the prevalence of cholera has been already referred to in a previous passage, and is as clearly traceable in the progress of the disease through the months of 1877. In the previous year, we have seen, the epidemic attained its hot-weather maximum in July, during the season of the south-west monsoon, and from August onwards steadily abated in prevalence to October; but in November it again acquired increased activity, and increasing with enormous bounds during the season of the north-east monsoon, attained a second maximum at the close of the year. This intense prevalence of the disease continued into the beginning of the following year, and in January 1877 the epidemic attained its cold-weather maximum. After this there was a gradual subsidence of the disease through the succeeding months to April, then a rise in May, followed by a fall in June, and again a rise to the hot-weather maximum attained in August, during the season of the south-west monsoon. In September a distinct fall occurred, and the disease continued steadily abating through the succeeding months to the end of the year, which closed with a marked tendency towards a subsidence of the epidemic, the registered mortality in January being 58,712, and in December only 7292. Notwithstanding this tendency to decline, the absolute mortality during the months of the north-east monsoon was more than double that of the south-west monsoon.

In this course the fatality of cholera was independent of the conditions produced in the population by the famine, although undoubtedly, to some extent, it was increased by the distress general among the people. The great rise in cholera deaths, which commenced in November 1876, took place when the population generally "had only begun to feel the effects of the food scarcity;" and in July and August 1877, which was the period of greatest suffering from insufficient food, cholera was not half so fatal as in the months of December 1876 and January and February 1877. That the antecedent conditions of the famine did in a very great degree contribute to prepare the people to fall victims to this cholera epidemic is shown in the annexed tabular statement, in which the cholera mortality of the districts affected by famine and scarcity is compared with that of the districts which were partially affected by the famine, and with that of the districts which were unaffected by famine for the year 1877.

Comparison of Cholera Deaths in Famine and Non-Famine Districts, 1877.

Districts.	Population.	Cholera Deaths.	Ratio per 1000 of Population.	Mean Ratio of previous 5 Years.
Early Famine Districts.				
Kurnool	914,232	10,451	11·4	0·2
Bellary	1,665,815	30,183	18·1	0·3
Cuddapah	1,350,967	33,102	24·5	0·8
Nellore	1,376,483	19,476	14·1	0·7
Chingleput (Madras)	934,523	4,391	4·6	0·5
Madras Town	381,926	6,246	16·3	0·7
North Arcot	2,014,254	42,145	21·8	0·9
Salem	1,966,362	47,633	24·2	0·9
Coimbatore	1,762,679	36,622	20·7	1·6
Madura	2,266,362	15,647	11·7	1·1
Later Famine Districts.				
South Arcot	1,755,324	25,783	14·7	1·1
Tinnevelly	1,693,629	14,214	8·3	1·1
Nilgiri	47,366	476	10·0	0·1
Kistna	1,452,066	12,374	8·5	0·2
Trichinopoly	1,199,155	15,447	12·8	1·5
Non-Famine Districts.				
Ganjam	1,388,619	3,290	2·8	0·8
Vizagapatam	1,483,503	6,932	4·4	0·7
Godavari	1,592,103	7,072	4·4	0·2
Tanjore	1,972,820	13,098	6·6	1·9
South Kanara	918,042	2,900	3·1	0·1
Malabar	2,253,258	9,957	4·4	0·3
Aggregate Results of above.				
Early famine districts	13,610,813	245,896	18·0	2·01
Later famine districts	6,147,540	68,294	11·1	1·6
Non-famine districts	9,451,189	43,249	4·6	1·3

The statement shows a very great preponderance of cholera mortality in the famine districts.

"As soon as the food-dearth began the lower classes of the villagers left their homes, making for the chief food-markets or centres of Government relief. The influx of the applicants for work or relief was so great that district officials were utterly unable to cope with the proper organisation of relief measures. The people were everywhere massed under unwholesome conditions, crowded in their daily tasks, and crowded in their sheltering-places at night. The long drought and absence of the north-east monsoon rains had caused scarcity of water for drinking and bathing, and in regard to relief works on the public roads, there can be no question at all that the few wells or springs available for the use of the people were often fouled in every conceivable way. Under conditions such as these, sudden explosions of cholera in groups of famine-relief coolies were almost inevitable, and, in fact, they were constantly occurring in those parts where relief measures were in progress during the early days of the famine. Then, again, the scarcity of grain and the usual articles of food caused the poorer classes to resort to extraordinary means of filling their stomachs. They ate the fibrous pith of the aloe stalk wherever it was to be had, fruits of the Indian fig, prickly pear, margosa, and leaves of many jungle trees—some nutritious and digestible, and others having probably only a mechanical action in distending the stomach. . . . All the normal insanitary conditions of native rural life, viz., bad feeding, bad housing, bad conservancy, and bad water, were intensified by the famine distress forcing the people to herd together in works and centres of relief."

That there has been no direct relation between the intensity of famine and the intensity of cholera has been already shown. In Kistna, South Arcot, Trichinopoly, and Tinnevelly districts, only partially affected by famine, and in Tanjore, Malabar, South Kanara, and the districts north of Kistna, wholly unaffected by famine, cholera pursued its epidemic course with greatly increased violence compared with its prevalence in those same districts in the preceding year; whilst in all the districts throughout the province, excepting

only South Arcot, in which the disease showed a persistent prevalence all through the year, cholera steadily and very greatly subsided towards the close of 1877.

In the Nilgiri district, "for the first time in our acquaintance with these hills, epidemic cholera has found a home in the Badager villages and the sanatoria of Coonoor and Ootacamund. The disease prevailed in the hottest and driest months of the year, and the hills, like the plains, had suffered from scanty rainfall and drought." The returns account for 476 deaths, of which 93 occurred in Ootacamund and 50 in Coonoor. "In Ootacamund the localities affected were the lowest and filthiest parts of the native bazars. Diarrhœa affected the European community, and one attack of cholera occurred in May." The mortuary returns for 1876 show that cholera was abroad in this district in that year also, though not, apparently, as an epidemic of sufficient violence to attract special observation.

Among the troops and the jail populations the incidence of the cholera of 1877 was strikingly uneven (see tabular statements Nos. III. and IV.) In the midst of the widespread and terrible suffering from cholera in this year, the Native troops suffered more than the European, but still very much less than the prisoners in jails. This is what was to have been expected, bearing in mind the very different life-conditions of the three classes compared.

Regarding the meteorology of the year, it is recorded—

"The peculiarities of the year 1877 as regards climate in the Madras Province were, 1st, the intensity of the sun's heat during the early months of the year; 2d, a cyclonic storm on the 20th May, giving in the south-eastern coast districts a plentiful, and in the neighbourhood of Madras a copious, downpour of rain; 3d, a delayed south-west monsoon, with 'breaks' so prolonged that in many of the districts depending on the early rains the early crops either failed or were greatly delayed on account of the deficient moisture; 4th, a very copious and general rainfall in September and October, continuing on to the usual season of the north-east monsoon; 5th, violent storms and floods in the southern districts of Tanjore, Tinnevelly, and Madura during the north-east monsoon, with partial or complete failure of the north-east rains in the coast districts north of Nellore."

The total average rainfall of the year for the province was 49.11 inches, but "the rainfall of 1877 has been remarkable more for the peculiarity of its distribution than for actual deficiency." The mean readings of the 222 registering stations are as follows:—

Mean of five years ending 1874	.	47.87 inches on	62	days.
Mean of the year 1875	. .	37.26 „	56	„
„ „ 1876	. .	27.81 „	42	„
„ „ 1877	. .	47.95 „	65	„

In May occurred a cyclonic disturbance in the Bay of Bengal, accompanied by rain in all the eastern coast districts excepting Madura and Tinnevelly, and extending inland to the districts of Bellary, Cuddapah, North Arcot, and Salem. "This rain was of great service in replenishing the water-supply, but it did not affect the level of the subsoil water so much as might have been anticipated. In many parts of the country subsoil water continued to recede until the heavy rains of September and October fell." The rains of the south-west monsoon, which are due on the Madras portion of the western coast in the first week of June, gave quite an average fall in that month in South Kanara, and somewhat above the average in Malabar. But the July rain on the western coast was very deficient; only 23.7 inches fell in South Kanara on 28 days against an average of 49 inches in 30 days, and no more than 11 inches in Malabar on 22 days against an average of 33

inches in 24 days. The June rainfall did not penetrate far into the peninsula, but was chiefly confined to the country below the Western Ghats.

The July rainfall was remarkably light on the Malabar coast, and above the Ghats there was very general failure of the rain in that month. In August the delayed monsoon began to fall heavily on the western coast, the rainfall in South Kanara and Malabar being nearly as much above the average of the month as it was below it for June. The rainfall on the western coast continued high through September and October, the fall in South Kanara and Malabar being still considerably above the average for those months.

With the setting in of the delayed monsoon on the western coast, rain began to fall very generally over the central plateau of Mysore, the Deccan, and Ceded Districts, and reached the eastern coast districts before the end of August. A copious supply of rain fell in September and October; it would have been more seasonable had it appeared two months earlier, but the general effect on the country after the prolonged drought "was simply marvellous;" cholera suddenly abated (see Table No. II.), but "the late arrival of the rains and the copious moisture developed blights, rusts, and insect life to such an extent that a large quantity of the early cholam and other dry cereals failed."

The north-east monsoon also was late and the rains irregular. In the northern districts, where the heaviest rain usually falls in the months of September and October during the south-west monsoon season, there was a very general failure of the late rains, and scarcity and distress were apprehended at the end of the year. In the southern districts of Tinnevelly, Tanjore, and Madura the north-east monsoon rains were excessive; but they were below the average in Coimbatore, Salem, North Arcot, and Nellore.

Regarding the food-supply, famine prevailed in 14 out of the 21 districts of the Madras Province more or less severely throughout the year.

"The Indian labourer in Southern India is not, by habit and custom, a rice-eater. His main staples of food are the various millets which are suitable to the soil and climate of the several districts, viz., cholam (*Sorghum vulgare*), raggy (*Eleusine coracana*), cumboo (*Pencillaria spicata*), and others, such as *Panicum frumentaceum*, *Panicum Italicum*, &c. He scarcely knows wheat, nor the way to use it. He eats certain beans and pulses occasionally, but not to the same extent as do the people of Northern India. He has a great liking for animal food of every description. Nothing in this way comes amiss to him. Fish, snails, frogs, field-rats, game of every description, fowls, goats, sheep, bullocks, and pigs are all eaten with avidity by the hard-working labouring man. In fact, there is no description of food obtainable from the vegetable or animal kingdom that the labouring classes of the people of Southern India will not use." The prices of grain, which were generally very high in January 1877, fell somewhat in the next two or three months; but the highest bazar rates for grain mostly occurred in July, August, and September. After October the common millets fell from 20 to 24 lbs. the rupee, or even more in some districts. "With the appearance of seasonable rain, also, green vegetable food became plentiful, and fish and snails abundant, helping much to lessen the intensity of the food distress."

1878.—There was a sudden and marked abatement in the prevalence of cholera in this year. The total of deaths amounted to 47,167; the figures for 1877 being 357,430, and 148,193 in 1876, and 94,546 in 1875, the year in which the epidemic commenced. At the end of 1878 the epidemic shows a decided tendency to die out, the deaths in January being 4439, and in December 1566. In several of the districts the disease had completely disappeared before the end of the year, and in others its presence was indicated by only a few deaths. In some districts, on the contrary, cholera remained persistent throughout the year, and was still actively prevalent at its close. To this last category belong the four districts of the northern

division. In the districts of Chingleput, South Arcot, Tanjore, Trichinopoly, Salem, Malabar, and South Kanara cholera still lingered in December 1878, but in all the other districts the disease had completely disappeared before the end of the year.

In illustration of the usually observed incidence and distribution of cholera among the general population in this province the following tabular statement is given, showing the number of villages in each district and the number affected by cholera :—

STATEMENT *showing the Number of Villages Affected and not Affected by Cholera in the Year* 1878 *in each District of the Madras Province.*

Districts.	Population.	Area in Square Miles.	Population per Square Mile.	Number of Registration Circles in each District.	Number of Towns and Villages in each District.		Number of Towns and Villages		Total Deaths Registered.
					Towns.	Villages.	Affected.	Not Affected.	
Ganjam . .	1,388,619	8,313	183	6	4	5,174	748	4,430	8,384
Vizagapatam .	1,843,503	18,344	118	18	6	2,915	636	2,285	4,456
Godavari . .	1,592,103	6,224	256	14	3	2,128	873	1,258	9,548
Kistna . . .	1,452,066	8,036	181	14	3	2,141	634	1,510	6,231
Nellore. . .	1,376,483	8,462	163	12	2	2,184	57	2,129	314
Madras Town	381,926	27	14,724	1	1	37	18	20	64
Chingleput .	934,523	2,753	341	7	1	2,394	16	2,379	85
South Arcot .	1,755,324	4,873	360	10	2	3,118	365	2,755	2,096
Trichinopoly .	1,199,155	3,515	341	8	2	1,674	123	1,553	484
Tanjore . .	1,972,820	3,654	540	14	5	3,967	515	3,457	2,744
Madura . .	2,266,274	9,502	238	9	5	1,224	49	1,180	275
Tinnevelly .	1,693,629	5,176	327	12	12	1,849	123	1,738	318
Kurnool . .	914,233	7,358	130	9	1	787	94	694	1,896
Cuddapah. .	1,350,967	8,367	161	12	1	1,311	269	1,043	3,261
Bellary . .	1,665,815	11,007	151	20	4	2,543	289	2,258	4,626
North Arcot .	2,014,254	7,139	282	12	5	5,241	15	5,231	74
Salem . . .	1,966,362	7,483	263	10	3	5,312	165	5,150	697
Coimbatore .	1,762,679	7,432	237	13	4	1,579	63	1,520	365
Nilgiri . . .	72,396	749	66	3	2	20	2	20	17
South Kanara	918,042	3,902	235	6	1	1,291	84	1,208	349
Malabar . .	2,228,228	6,002	377	17	6	436	80	362	883
Total. .	30,749,401	138,318	226	227	73	47,325	5,218	42,180	47,167

Among the troops and jails the subsidence of cholera in this year is as clearly marked as among the civil population (see Table No. V.)

Regarding the meteorology of the year it is observed that—

"For some years before the great famine period of 1877 the seasons had been irregular and the rainfall unusually scanty. In 1877 the rainfall was irregularly distributed, most of it coming too late and in excessive amount for the ordinary dry crops. In 1878 the seasons had not resumed their normal course. The south-west monsoon rains were later than usual, but, on the whole, quite up to the average in quantity. The rains of the north-east monsoon, on which the southern districts mainly depend, were almost a complete failure. In November and December the rain-clouds were diverted from their proper course by cyclonic storms, and the rain that should have refreshed the southern portion of the peninsula of India fell in torrents where it was not wanted, viz., in the Godavari, Vizagapatam, and Ganjam districts, doing immense damage in local areas to standing crops."

The rainfall of 1878, as shown in the following statement, compared with the rainfall before and during the famine, shows an excess over that of any of the preceding eight years. The results derived from 227 rain-registering stations scattered over 137,569 square miles of country, of course, can at most indicate only somewhat fairly the general condition of the country in regard to excess or deficiency of rainfall from year to year.

Mean Rainfall of 227 Registration Stations.	Inches.	Days.
From 1870 to 1874	47.85	60
In 1875	37·35	56
„ 1876	27.88	42
„ 1877	48.03	68
„ 1878	51.28	69

The monthly returns of rainfall show that the south-west monsoon from June to October gave a more abundant rainfall than usual. South Kanara, Malabar, as well as the districts to the east of the Ghats, viz., Bellary, Cuddapah, Kurnool, and Kistna, all received considerably more than their average rainfall. The northern districts of Ganjam, Vizagapatam, and Godavari not only received a plentiful supply of rain from the south-west monsoon, but they received also an excessive rainfall from the north-east monsoon. In the southern and central districts the south-west monsoon rains, though delayed somewhat, appear to have been generally above the average in quantity; but the north-east monsoon rains, which usually come in November and December, were almost a complete failure. The total rainfall of the southern districts in 1878 was therefore, on the whole, below the average, as is shown in the subjoined abstract :—

Average of 5 years ending 1874.	Inches.	In 1878. Inches.
Chingleput	53	30
Madras Town	63	28
Nellore	38	28
North Arcot	43	37
South Arcot	46	34
Tanjore	46	32
Tinnevelly	24	22

Regarding the prices of food, it is stated that an immediate consequence of the unseasonable rain distribution was, that prices of food ceased to recede rapidly from the abnormal height attained in the famine period. The actual market-prices of the staple food-grains during 1878 were at practically famine rates throughout the year. The millets, which are used by five-sixths of the people, as a rule, continued at more than double their ordinary price, and the tendency to decline in prices until nearly the end of the year was scarcely observable.

"While these famine rates of food-grains continued throughout the year, neither the gross mortality nor the actual condition of the people indicated that the population, as a whole, were suffering in anything like the degree they did in 1877. On the contrary, there was a visible and manifest improvement in the physical condition of the great mass of the people throughout the year." This is explained by the fact of "the agricultural population using their customary quantities of grain, notwithstanding the famine prices prevailing in the open markets," and this they were enabled to do in consequence of their habit of putting "aside enough grain for their family wants and for payment to labourers. This portion of the crop never finds its way into

traders' hands at any time. . . . The ryots had been able to grow enough food for home consumption, and to pay their hired labourers, and partly to replenish stocks, but they had no surplus large enough to influence market-prices in addition. . . . The great mischief of the famine, as regards public health, was the scarcity of food from November 1876 to August 1877. . . . To the enfeebled condition of the survivors of the poorer classes is attributable most of the excess of mortality occurring in 1878."

1879.—The returns for this year show a continued and very marked subsidence in the prevalence of cholera, the total of deaths registered from the disease having fallen to 13,296 from 47,167 in the year before. In the end of 1878, with a more or less generally complete subsidence of cholera activity in most districts of the province, the three northern districts on the eastern coast, and Kistna, South Arcot, Tanjore, and Trichinopoly in the south of the peninsula, and Malabar on the western coast, still showed the continued persistence of the disease. In the first of these three groups the districts of Ganjam and Vizagapatam show a continuous rise in the prevalence of cholera during the early part of 1879, and then a rapid decline to subsidence in April; a few cases occurred in each district, mostly in Vizagapatam, during the months of the south-west monsoon, but in September the disease had ceased activity. In the Godavari and Kistna districts cholera prevailed with considerable epidemic persistence, with the usual decline in March and rise to maximum intensity during the hot-weather rainy months. In Godavari the disease continued active till December, but in Kistna it ceased in September; in the former 9014 deaths were registered in the year, and in the latter 2389, and together these two districts contributed 11,403 out of the gross total of 13,296 cholera deaths registered among the civil population during the year.

Of the three districts in the second group, Tanjore alone showed the disease in epidemic form; it finally subsided in September, with 894 deaths registered in the year. In the Malabar district (the third group) the disease rapidly subsided, and finally ceased in March.

In all the other districts, with the exception of a slight and short-lived reappearance in Madura in February and a few widely-scattered cases in Nellore and Madras, there is no trace of the presence of cholera throughout the year. The decadence of cholera in these districts in the latter part of 1878 was completed and maintained in 1879. In fact, cholera in 1879 had disappeared from the greater portion of the province. The year commenced with 2948 deaths from the disease in January, and ended with only 4 in December.

The rainfall of 1879, though it did not equal that of 1877 or 1878, "far surpassed that of the unfortunate year 1876, and nearly reached the average of the rainfall for the six years ending 1875." The rainfall of 1879, "though somewhat less than the average, and considerably less than the fall of 1878, was more equitably and proportionally distributed than the rainfall of the previous year."

Regarding the prices of food, the returns show that, although the price in 1879 compares in all the three grains—rice, cholam, and raggy—favourably with the prices that obtained during 1877 and 1878, in none has it yet reached the average. Still, the prices which ruled during the last six months of the year compare favourably with the first six months, and in some districts (viz., Bellary, Kurnool, Madura, Tinnevelly, and Vizagapatam) almost reached the average prices of the six years 1870 to 1875.

1880.—The mortality registered from cholera in this year among the civil

population amounted to only 613 deaths. In no year since the introduction of registration in 1866 has the mortality from cholera fallen so low, except in 1874, when the deaths were 313.

In 1880 cholera was entirely absent from 7 out of the 21 districts throughout the year, and in most of the others only 3 or 4 scattered deaths occurred. The prevalence of the disease was mostly localised in Ganjam, which district contributed no less than 495 out of the 613 deaths of the year. Tanjore is the only other district which shows the presence of the disease persistently through the year, but only 23 deaths were registered altogether. With the exception of these two districts, Ganjam and Tanjore, cholera by the middle of 1880 had disappeared from the Madras Province. It is to be noted, however, that the year began with 9 deaths in January, and ended with 219 in December; and, further, that of the latter number, 216 occurred in the Ganjam district alone, in which, after two months' absence, cholera reappeared in November, with 7 deaths. In November only two other cholera deaths were registered throughout the province; they occurred in Tanjore, which also gave 2 out of the 3 remaining deaths unaccounted for in December; the other occurred in Kistna.

Regarding the rainfall, that of 1880 exceeded that of the year before, and in the greater number of districts, 13 out of 21, was above the average; in the southern parts of the province, Malabar excepted, it was universally so. "The north-east monsoon, on which these districts mostly depend, was a very abundant one; such a downfall of rain as took place in November and December has not been known in Madras and the country around for many years." On the other hand, the south-west monsoon was not an abundant one; the districts of Malabar, South Kanara, Godavari, and Kistna, which depend more especially on that season for their rain-supply, received less than in the year before, and less than the average of seven previous years. On the whole, however, the rainfall of 1880 "may be looked upon as having been eminently favourable for the whole of Southern India, and the prices of food bear out this conclusion."

As regards food-supply, there was a marked improvement in prices in this year. Out of the 21 districts, the average prices of former years were touched in 9, and in some, as Vizagapatam, Kistna, Kurnool, and Tinnevelly, even surpassed. In 2 it almost reached the average, but in 7 others, which felt the stress of famine most severely, prices yet remain below the average. Yet in these, as in all the districts, the amount of food obtained for the same price, as compared with 1878-79, shows a marked improvement. "On the whole, the price of food throughout Southern India during 1880 was conducive to a satisfactory sanitary state of the population."

1881.—The returns show a revival in the activity of cholera in this year, the total of deaths registered having risen to 9446 (see Table No. I.) At the close of the preceding year the Ganjam district alone showed cholera in active prevalence, as already stated, and in Tanjore the disease was more or less present throughout the year, but in a very mild degree—altogether only 23 deaths being registered. This number was made up by contributions from 20 places (towns and villages), out of 3972 in the district, and during ten out of the twelve months of the year. In the Ganjam district the 495 deaths registered were contributed by 108 places, out of a total of 5178 in the district, and during nine out of the twelve months, the highest number of deaths recorded in any one month being 216 in December, as before mentioned. In all the other districts affected by cholera in 1880—12 in number, 7 districts having remained exempt from the disease throughout the

year—there was no sign of the presence of cholera from the end of July to the end of the year, excepting only a single death in Vizagapatam in October, and another in Kistna in December.

The year 1881 opened with an absolute absence of cholera in every part of the province, excepting only the district of Ganjam. In Ganjam the disease continued with successive fluctuations until July, in which month it finally disappeared from the district, only a single death in October being recorded during the rest of the year. In the adjoining district of Vizagapatam cholera made its appearance towards the end of March, and prevailed with some activity until the beginning of July, when it finally disappeared during the rest of the year. In South Arcot single deaths from cholera were recorded in February and March, a few in May, June, and July, and a single death in August. In Tanjore cholera appeared first in May, in which month three deaths were recorded. These were followed by a few deaths in June and July, and then the disease ceased. Besides these appearances of cholera, two deaths from the disease were recorded in Godavari in April, and four in Malabar in June. All the other districts of the province remained absolutely free of cholera up to the end of September, except the district of Tanjore alone, in which the disease reappeared in that month, with four deaths registered. Thus, up to the end of September, 15 out of the 21 districts in this province continued absolutely free of cholera, whilst in the other 6 the disease had entirely disappeared by the end of July, a single death only being recorded in the beginning of August in South Arcot.

In the month of October, the period of the commencement of the north-east monsoon, cholera burst into activity in all the districts to the south and west of Madras inclusive, excepting only Nilgiri, which shows no record of the presence of the disease; and there was also a limited outbreak in Bellary, to the north-west of Madras, which was confined to that month. In the four coast districts, and in Kistna, to the north of Madras, there was no trace of the presence of cholera up to the end of the year, since the disappearance of the disease from Ganjam and Vizagapatam in the July preceding, excepting only the solitary death recorded in Ganjam in October. Of these 5 districts, Godavari (excepting 2 deaths in April), Kistna, and Nellore remained absolutely free of cholera throughout the year. The district of Kurnool, excepting a solitary death in October, enjoyed a similar immunity; whilst Cuddapah registered only 6 deaths during November and December, and Bellary only the outbreak in October, which, however, caused 121 deaths.

All the other districts—and they are those more directly influenced by the north-east monsoon—were affected by cholera in October (Tinnevelly and South Kanara not until November), and the disease continued active in them to the end of the year, and more especially in the southernmost districts, Tanjore, Trichinopoly, and Tinnevelly.

Some particulars regarding this autumnal revival of cholera in 1881 in the Madras Province are recorded in the Report of the Sanitary Commissioner for that year. Among others, it is stated that the disease "was gradually making its way down from the Deccan, when a feast at Tirupati, in North Arcot, suddenly gave it an impetus, and sent it, with its dispersing pilgrims, into every collectorate in Southern India." But the validity of this assertion is by no means established by the statements next made in its support, viz., that "during the early part of the year returns showed it to be rife in the Bombay Province, and that it was making its way down towards us. In August we have the first return from Raichore of a child in the house of the railway people, and on inquiry it was ascertained several

cases had occurred amongst the inhabitants of that town, which is under the sovereignty of the Nizam." No facts, however, are adduced to connect this appearance of cholera in the territory of the Nizam with the cholera which in the following October suddenly appeared as an active epidemic in the Madras Province.

The Bombay returns show that the cholera of 1881 in that province broke out in epidemic activity during the month of May in the Northern Konkan districts of Bombay city and Thana, and in the adjoining Surat district of the Guzerat division, and also in the Khandes district of the Deccan; that during June the disease commenced an epidemic course in the more southerly Konkan districts of Kolaba and Ratnagiri in the one direction, and in the Broach district of Guzerat, to the north, in the other—all on the western coast—but made no advance inland during this month; that during July and August cholera broke out with more or less epidemic activity in all the other Deccan districts excepting Dharwar, which remained almost completely free of the disease throughout the year, whilst at the same time it appeared in the remaining districts of Guzerat, excepting Panch Mahál, which preserved a complete immunity throughout the year; and, finally, the returns show that whilst the main force of the cholera of 1881 in the Bombay Province was confined to its northern districts on the western coast and the Deccan plateau, the disease was everywhere on the decline in October. In the three southernmost of the Deccan districts, viz., Belgam, Kaladgi, and Dharwar, which are nearest to the Madras districts of the Malabar coast and the Nilgiri Hills, the cholera of 1881 made little epidemic progress, and in Dharwar its mere presence is indicated by only 5 deaths registered throughout the year, viz., 2 in January and 3 in September.

The evidence of the Bombay returns points to no tendency of the cholera of 1881 in that province to extend into the Madras Province. On the contrary, the evidence afforded by these returns shows that the force of the cholera of 1881 in the Bombay Province was expended in the northern districts of its western coast and Deccan plateau respectively—the area, in fact, which was more directly under the influence of the south-west monsoon in that province, just as the autumnal epidemic in the Madras Province prevailed in the area under the direct influence of its north-east monsoon. That there was no continuous extension of the disease from the Bombay Deccan districts to the Madras Province is clear from the absence of epidemic prevalence of cholera in the intervening districts of Mysore and Haidarabad at the time of the first case above cited as returned from Raichore in August. Whilst the fact of more than a full month having elapsed between the occurrence of that case and the others said to have occurred among the native inhabitants of the Raichore town, and the next cases which were reported in the Madras district of North Arcot, is further corroboration of the independent origin of the autumnal cholera of 1881 in the Madras Province, especially as the town of Tirupati, in which those next cases were reported, is situated on the same line of railway as Raichore.

The commencement of the autumnal cholera of 1881 in the Madras Province was first observed in the town of Tirupati, in the North Arcot district, where the disease made its appearance on the 2d October, with five cases reported, of which three proved fatal. The town of Tirupati is famous for its temple, situated on a high hill, which is somewhat inaccessible, and is "resorted to yearly and oftentimes in the year by thousands of pilgrims from all parts of India." Regarding the fare of those who visit this temple as a religious ceremony it is recorded—

"These pilgrims depend almost entirely for their meals on the temple prasadum, which is, in a sanitary point of view, anything but satisfactory. This sacred meal, which is offered for sale at a very cheap rate, is quite unfit for human consumption. One-third of this meal is composed of sand and dirt and remnants of obnoxious insects. The prasadum is also composed of unboiled or half-boiled rice not cleared of the bran, gravel, or grit, and the cakes made of the same sort of materials, in addition to old rancid and rotten ghee. The cakes are kept for days before they are consumed. It is obligatory on the part of every pilgrim to eat a portion at least of this sacred prasadum on account of its being an offering to the Deity, and it is a sacrilege on the part of any one even to examine the same whether it is good, and blasphemy to say that it is bad. The very few who attempt to cook their food only get articles such as to cause diarrhœa, even among the strong-constitutioned pilgrims. The water used by the majority of the pilgrims is from a tank which has been used by pilgrims for years for washing, bathing, drinking, and other purposes; thus it becomes very injurious to the health of the pilgrims who use the water."

Following the above description, which is by the Native hospital assistant, who had been in charge of the dispensary in Lower Tirupati for six or eight years, it is stated by Dr. Cornish, Sanitary Commissioner for Madras—

"A large number of pilgrims arrived from the Bombay side and Central Provinces, where cholera was known to be prevalent, but no cases of the disease were noticed in pilgrims ascending the hill by the hospital assistant at Lower Tirupati or by the medical subordinate stationed near the pagoda on the hill. The first cases noticed were in persons belonging to the Madras Province, who had visited Tirupati for the festival. . . . The insanitary conditions abounding at Upper Tirupati no doubt had the effect of lighting up the disease, and the dispersion of the pilgrims apparently helped its spread southwards."

But why only southwards, and not also in all other directions in which the pilgrims dispersed, is a point which does not seem to have been considered worth inquiry, notwithstanding the notorious fact that the spread of the disease southwards, and southwards only, was coincident with the progress in that direction of the prevailing monsoon influence of the season.

The mortuary returns for the year 1881 show that the autumnal cholera, which was first observed at Tirupati on the 2d October, made its appearance during that same month in all the districts situated to the south of Madras and North Arcot inclusive, excepting only Tinnevelly and South Kanara, in which the disease did not appear until the following month, and excepting Nilgiri, which returned no cholera at all throughout the year; whilst of the districts to the north of Madras and North Arcot, the disease broke into activity in Bellary alone.

After the appearance of cholera at Tirupati on the 2d October, the next appearance of the disease successively in other parts of the province are recorded in the following order:—

Madras, 6th October.—The case of a woman who came from Tirupati, "and brought the seeds of the disease with her." Madras is in direct railway communication with Tirupati and Raichore, in the latter of which cholera was reported among the railway people in August preceding.

South Arcot, 8th October.—Two cases occurred, both fatal, in Puttoor, village of Vridduchalam subdivision. "It appears these were pilgrims to Tirupati, where they caught the contagion. On their return home, by the time they reached Villupuram, they became worse, and died after they reached their village."

Kurnool, 10th October.—"A Mussulman merchant, who came *via* Gooty (a station on the north-west line of rail); but there is no evidence to show this man had had any communication with Tirupati or its pilgrims." This was the only case of cholera reported from the Kurnool district throughout the year.

Salem, 11th October.—"The first person attacked was a young police constable who had been in the police for two months in Salem, and who had not been out of the place since his enlistment." He lived in a chultrum in the centre of Salem, where travellers resorted, and the civil surgeon reports—"I think it probable that he may have been infected by some one returned from Tirupati, where cholera is reported to have prevailed, but no evidence of any returning pilgrims having stayed there can be obtained." The collector reports in continuation—"It was afterwards ascertained that on the 7th October a party of Malabar Brahmins returning from Tirupati feast alighted from the 7.25 P.M. train at Suramungalam and went to the Local Fund chultrum near the station, where one of their number was found to have cholera. Some of his companions applied to the railway apothecary, who gave them medicine for the patient, but did not visit him. He got better, and the whole party proceeded on their journey by the 3.20 A.M. mail-train the same night. A party of Salem weavers returned from Tirupati by the same 7.25 P.M. train, and having put up for the night at the chultrum, went into Salem the next morning." The chultrum here referred to, and described as near the railway station, is evidently not the same chultrum in which the police constable lived, for that is described as "in the centre of Salem." The collector, thinking "it is as probable as not that the disease was introduced into the town of Salem by others," continues—"I have no doubt it came from Tirupati, and there were many returning from the feast at this time who may have brought it with them." But he adds—"It will be observed, however, that of the first six cases five were Mussulmans;" and this is important evidence in favour of the independent origin of the disease in this town, for it is not probable that these Mussulmans had any communication with the Hindus returning from Tirupati.

Chingleput, 12th October.—No particulars are given of the appearance of the disease in this district. The collector reports it to have been imported from Tirupati.

Bellary, 14th October.—A very smart outbreak of cholera occurred here on this date in the quarter of Bellary town inhabited chiefly by Mussulmans and peons. Inquiry failed to connect the outbreak in any direct way with Tirupati, although a large number of the people of this town had been to Tirupati. No details are given of the circumstances connected with this isolated outbreak, but it is gathered from the distribution statement of the disease that of the total 121 deaths registered 116 occurred in the municipal town of Bellary, the first on the 14th October, the last on the 30th November, and the other 5 in four different villages, the first on the 19th and the last on the 30th October. These solitary cases were doubtless, as has been so frequently and regularly observed in other places on the like occasions, those of villagers who had visited the town of Bellary whilst the disease was at its height there, and, falling ill of it, succumbed to its effects on their return home.

Trichinopoly, 19th October.—The first case reported as occurring on this date was that of a cart-owner of the village of Thotleigam, "who had gone to Salem, was attacked on his way home, and died on reaching his village."

Coimbatore, 20th October.—This was the case of a man returning by railway from Tirupati to the western coast. It appears he was attacked on the journey, and, alighting at Coimbatore, died there.

Madura, 25th October.—This case occurred in the town of Pulni, and, with the two subsequent cases in this month, it was reported "they were pilgrims from Selanar attached to Calicut (Malabar district), and undoubtedly

brought the cholera with them." But, as will be seen in the next paragraph, the first appearance of cholera in Malabar was not until a full week later, and, moreover, was in the person of a pilgrim from this same town of Pulni, although in the death returns furnished by the police a single death from cholera is recorded in the Malabar district in October.

Malabar, 2d November.—On this date one case of cholera occurred at Palghat, on the confines of Malabar. "This man was a pilgrim from Pulni, in the Madura collectorate."

Cuddapah, 7th November.—The case on this date, it is recorded, was that of a fireman, aged 40, residing at Tirupati, who came to Cuddapah station at 8.30 P.M. on the 5th instant, and died on the morning of the 7th. Two other deaths from cholera were registered in this district in November, and 3 more in December; total of the year, 6. Of these, besides the death in Cuddapah town, one occurred in the Pallamput village on 9th November, and 4 in the village of Madanapally, the first on 20th November, the last on 7th December.

South Kanara, 12th November.—The first case in this district is reported to have occurred on 12th November, among a party of pilgrims returning from Tirupati.

Tinnevelly, 26th November.—An inquiry was made by the collector, in company with the district surgeon, as to the origin of the outbreak of cholera in Tinnevelly on this date, "but without any result."

Thus, of the 13 first cases observed (exclusive of that in Raichore, which is not connected with Madras), and of which the particulars are above recorded, it appears that, excepting the outbreaks at Bellary, Chingleput, and Tinnevelly, regarding which no details are given, the victims in every instance (the police constable at Salem excepted) were travellers or pilgrims exposed to vicissitudes of weather and the privations and hardships, particularly in respect to food, attendant upon journeys as performed by natives of this country.

Regarding the cholera epidemic in the Salem district, it appears from the distribution statement of the disease that of the 9 rural and 1 town circles of registration in the district, the latter and 6 of the former together recorded a total of 540 cholera deaths in the year. Of this number 130 occurred in Salem town circle, the first on the 11th October, the last on the 31st December, and 410 in 85 villages of the 7 rural circles affected, the first also on the 11th October and the last on the 31st December, the year closing with the disease apparently still in active prevalence.

Concerning the disease in the town of Salem itself some particulars are recorded. The first case observed was that of the police constable already mentioned. He was a Mussulman, and was attacked at drill in the police-office compound, immediately opposite the chultrum in which he lived, in the afternoon, and was taken to the police hospital beyond the lines, where he died at ten P.M. Of the next cases which followed no account is given.

It appears, however, "that by far the greater number of deaths occurred amongst people using the river-water," which is described as defiled "by the filth from drains, the filth from dirty clothes, and the filth from men's bodies." It appears also "that more than five-sevenths of the whole number attacked occurred amongst caste Hindus—people who obstinately cling to the use of this river-water from religious belief. The Mussulman population almost escaped, the European and East Indian entirely, and, strangest of all, the inhabitants of Kitchipoliem, chucklers, low-caste people engaged in most filthy occupations, also enjoyed an immunity from this dread scourge. They are not allowed to use the river-water." The course of the disease is shown to have been mainly along the banks of the river (in a sketch-map accompanying the Report), and the village of

Kitchipoliem, mentioned as having enjoyed an immunity from the disease, is situated well away from the river. That the use of the river-water alone is not to be justly saddled with the cause of the disease is evidenced by the statement that the division of the town in which the inhabitants used well-water instead of that of the river suffered as severely from cholera as most of the other parts of the town along the river-banks. Apart from all this it is added—"The curious feature of the epidemic is its weighty incidence on children; nearly one-half of those attacked were children under 15 years of age, and fully one-half of the deaths occurred amongst them." In the absence of all particulars of the conditions of life affecting these children as distinct from the adult population, it is impossible to account for this excessive incidence and fatality of the disease among them, except by mere assumptions based on the greater helplessness of that class of the general population; but in the case of the immunity enjoyed by the inhabitants of Kitchipoliem, notwithstanding their "most filthy occupations," it is evident that, from the mere fact of their local situation, they were removed away from the influences which prevailed along the banks of the river.

Regarding the meteorology of the year in respect to rainfall, the year 1881 was a year of scarcity. Not only was the total rainfall less than the average, but in all the districts, without exception, the rain fell short of the usual supply. Both monsoons were below the average.

The prices of food in 1881 were cheaper than in any other year of the twenty with which this history deals, excepting only 1871, in which year the average price of the staple food-grain surpassed in cheapness that of this year in the proportion of 33.87 sers the rupee to 31.62 sers the rupee respectively.

Summary Review.

The net results of cholera mortality, average rainfall, and average prices of the staple food-grain in the Madras Province during the twenty years 1862 to 1881 are shown at one view in the Table No. V.

The records show that in 1862 cholera was epidemic over the province generally, except in the western coast districts, where it appears to have been less severely prevalent. Of its ravages among the civil population in this year there are no statistics, but the incidence of the disease among them may be approximately gauged by the mortality among the troops and jails, which, for both classes taken together, gives a death-rate of 3.78 per mille of strength. The jail populations taken alone, however, give a death-rate of 10.00 per mille, and this ratio furnishes a more correct clue to the loss from cholera among the civil population, because, in seasons of distress for food, such as prevailed in this year in many parts of the province, the jails rapidly become filled and overcrowded with the poorer classes of the people, who are driven to crime by want of food.

In 1863 cholera acquired fresh activity, and prevailed with severe epidemic force over the whole province. Among the troops and jails it caused a mortality not far short of double that of the preceding year, their combined death-rate being 6.96 against 3.78 respectively. In the jails alone the death-rate rose to 28.80, from 10.00 in the year before. This high rate among the jail populations is approached again only in the famine years 1866 and 1877, when it was 25.59 and 26.12 respectively. Food in 1863 was dearer than in the preceding year, but had not generally risen to famine rates for the province as a whole. The rainfall of the year was fully up to the average of subsequent years, taking all the districts together.

In 1864 cholera abated somewhat, but still prevailed with severe epidemic force in many parts of the province, except in the northern districts of the eastern coast. The death-rate for the year among the troops and jails combined fell to 4.68 from 6.96 in the year before. The abatement was most

marked in the death-rate of the jail populations, which fell to 9.34 from 28.80 in the preceding year. Food was somewhat cheaper in this year, but the rainfall was below the average.

In 1865 the decline of cholera which had set in during the preceding year was arrested, and the disease, starting into fresh activity, prevailed with much increased epidemic violence over the whole province generally. The death-rate of the troops and jails rose again to near the proportions it had attained in 1863, viz., to 6.56. In this year, as in 1863, the mortality was mainly contributed by the jail populations, their death-rate having risen to 16.24 from 9.34 in the year before. Food in this year was very dear, the price in many parts touching famine rates. The rainfall was considerably below the average.

In 1866 cholera again acquired renewed activity, and prevailed generally with very severe epidemic intensity both among the troops and jails and among the civil population. The death-rate for the former classes rose to 8.85, and among the latter was found to be 8.94 per mille. Famine prevailed in the land, and the rainfall was still below the average, though somewhat above that of the preceding year.

In 1867 again cholera abated everywhere in the province, and with a suddenness and completeness which are very noteworthy. The death-rates fell to 0.82 among the troops and jails, and to 1.49 among the civil population. Yet the year was one of famine rates for food and of severe drought in the province generally. In this connection, refer to the remarks on food-supply given at the close of the descriptive history for the year 1878, p. 50.

In 1868 there was a still further and continuous abatement of cholera, and the disease subsided to a minimum prevalence. The death-rates sunk to 0.26 for troops and jails, and to 0.36 for the civil population. Food had become very much cheaper, and the rainfall made some considerable approach towards the average.

In 1869 again cholera revived in activity, and the death-rates went up, but there was nothing like an approach to the high figures attained in the preceding years of famine and drought. The death-rate for the troops and jails was 2.21, and for the civil population 0.87. Food was slightly dearer than in the preceding year, but the rainfall was an average one.

In 1870 cholera abated in most parts of the province, except in the southern districts, where it prevailed with much severity, and caused a marked rise in the general death-rate of the province from this disease. This epidemic in the southern districts is attributed to the effects upon the subsoil-water of a cyclone in November of the year before, as related in the descriptive history for the year 1870. In consequence of this epidemic in the southern districts the death-rate of the general civil population rose to 2.32, but the death-rate for the troops and jails, following the general abatement of the disease, fell to 1.12. Food in this year was somewhat cheaper than in the year before, whilst the rainfall was abundant and above the average.

In 1871 there was a still further and continuous abatement in cholera prevalence. Among the civil population the death-rate sunk to 0.72, but among the troops and jails it rose slightly, viz., to 1.49. This rise was caused by increased mortality among the European troops only, in consequence of an outbreak of cholera in the Secunderabad cantonment, the particulars of which have been given on a previous page (see history of 1871). Otherwise the cholera of this year had everywhere in this province

generally subsided to a minimum prevalence. Food in this year was abundantly cheap—cheaper than in any other year of our series; the rainfall also was abundant, and equalled that of the year before.

In the three years 1872–74 cholera steadily continued at a very low rate of prevalence, and continuously subsiding, practically disappeared from the province in 1874. In this last year there was no mortality from cholera among the troops and jails, whilst among the civil population the disease produced the merely nominal death-rate of 0.01 per mille. In 1873 also there was no cholera mortality among the European troops. These three years were years of cheap food and plentiful rainfall, such as had not been experienced in any previous year of our series.

In 1875 again cholera renewed its activity, and broke out afresh in epidemic prevalence. The death-rate among the troops and jails rose from a blank in the year before to 2.57 in this year, and among the civil population from 0.01 to 3.12 respectively. The prices of food had begun to get dear, and there was a sudden and marked deficiency in the rainfall, which sunk much below the average.

In 1876 cholera, instead of abating from the activity of the preceding year, prevailed with doubled force. The death-rates rose to 4.26 among the troops and jails, and to 5.08 among the civil population. Food in this year was very dear and the rainfall exceptionally deficient, no such season of drought having been experienced in any other year of our series of twenty.

In 1877 cholera still prevailed with severe epidemic violence, and caused an unprecedented mortality. The death-rates attained the high figures of 13.14 among the troops and jails, and 12.24 among the civil population. Food in this year was at famine rates, and distress was severe and widespread among the people. The rainfall was heavy and above the average.

In 1878 cholera suddenly abated from the intensity of its prevalence in the preceding year, but showed a tendency to a renewal of activity in the northern districts of the eastern coast. The death-rates fell to 3.74 among the troops and jails, and to 1.62 among the civil population. Food was still at famine rates in the market, but the rainfall was abundant and much above the average.

In 1879 there was a still further abatement of cholera; the death-rates fell to 0.69 among the troops and jails, and to 0.46 among the civil population. Food became generally cheaper, and the rainfall was fully up to the average.

In 1880 cholera subsided to a minimum prevalence, and almost disappeared from the province. In this year there was no mortality from cholera among the European troops and among the jail populations, whilst among the Native troops the death-rate from it was only 0.07. Among the civil population the death-rate was only 0.02. Food had become very cheap, and the rainfall was above the average.

In 1881 again cholera commenced a revived activity, but with no approach to the intensity of prevalence it had acquired in the recent preceding years of famine. Among the troops and jails the death-rate rose to 1.66, and among the civil population to 0.31. The European troops, however, in this, as in the two preceding years, suffered no mortality from the disease. Food was exceptionally cheap—cheaper than in any year of the whole series, excepting only 1871. But the rainfall was very deficient, and much below the average; the year was one of drought similar to that of the years 1875 and 1867.

Thus we find that, in the period of twenty years dealt with, cholera in the Madras Province has on two separate occasions been greatly prolonged in its epidemic prevalence and greatly aggravated in its destructive effects by the concurrent existence of drought and famine. An examination of the death-rates for the troops and jails and for the civil population during the whole series of years, given in table No. V., shows that cholera in this province has a tendency to run a definite course of revival, decline, and subsidence in the successive years of each triennial cycle. These triennial periods are shown in most regularity for the cycles 1866–68, 1869–71, 1872–74, and 1878–80 by the death-rates for the troops and jails together. In the cycles 1863–65 and 1875–77 the regularity in succession of revival, decline, and subsidence is completely destroyed by the effects of the drought and famine of those periods. In the death-rates of the disease among the civil population the regular course of cholera above indicated is best exhibited in the cycles 1866–68, 1872–74, and 1878–80. In the cycle 1875–77 the regular course is marred by the effects of drought and famine during that period; but in the cycle 1869–71 the break was the result of an epidemic outbreak of cholera in the southern districts of the province consequent on the effects of a cyclone in November of the preceding year. The revived activity of cholera in 1881 indicates, in the light of the preceding experience, the commencement of another triennial cycle of cholera revival, decline, and subsidence.

SECTION III.

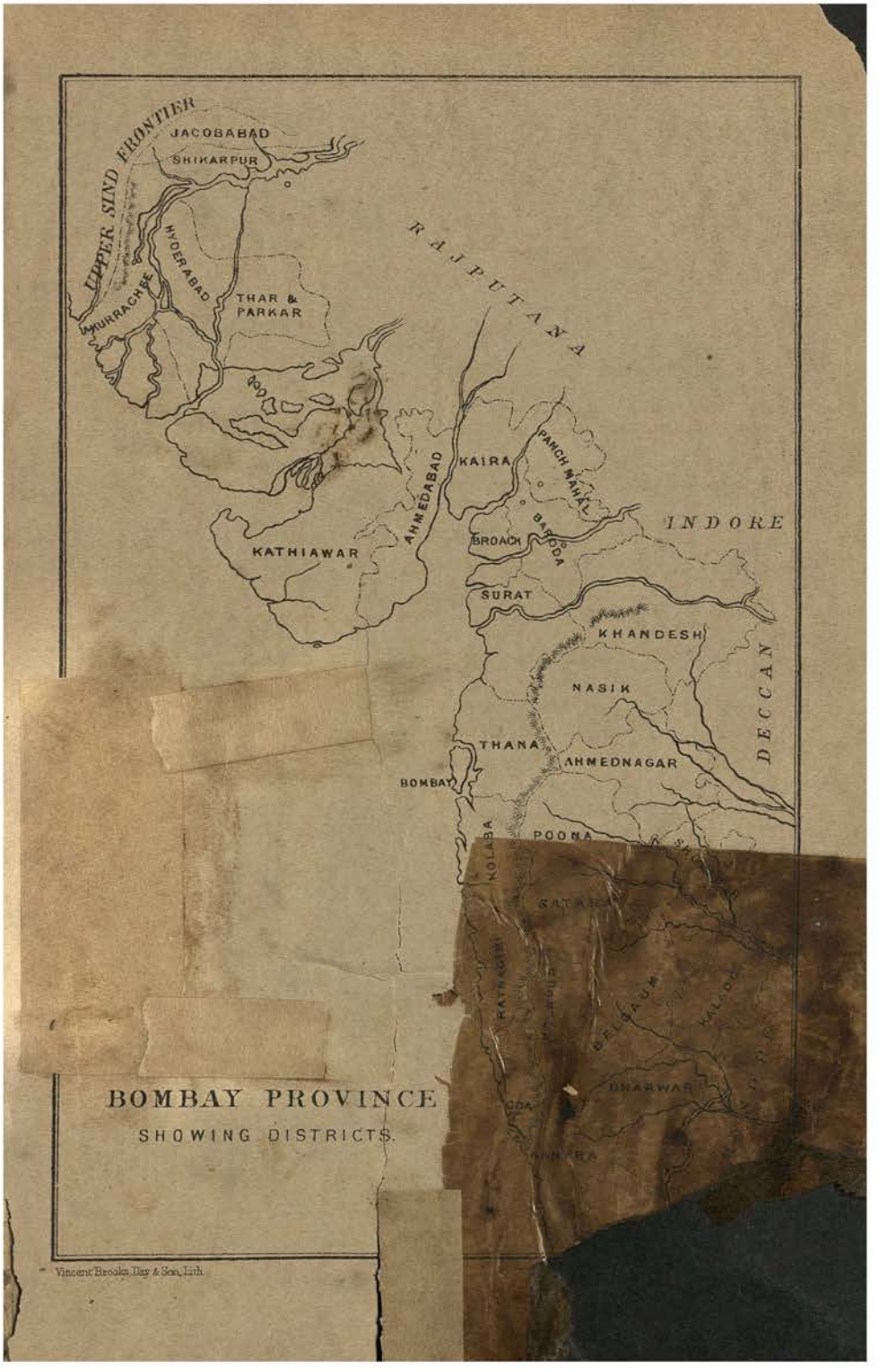
BOMBAY PROVINCE.

Geographical Position.

THE Bombay Province, with its twenty Native States, extends from 28° 47′ to 13° 53′ N. lat., and from 66° 43′ to 76° 30′ E. long., and forms the Western Province of India. The divisions, districts, area, and population under British administration are shown in the annexed tabular statement.

STATEMENT *showing Population, Area, and Density of Population in each District of the Bombay Province for the Year* 1872.

Divisions.	Districts.	Population (Census 1872).			Total of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Deccan.	Khandesh	530,610	498,032	1,028,642	7,966,061	9,802	53,844	104·10	159·25
	Násik	376,851	357,535	734,386		8,140		90·22	
	Ahmednagar	395,336	378,602	773,938		6,647		116·43	
	Poona	466,757	440,478	907,235		5,099		177·92	
	Satara	567,398	548,652	1,116,050		4,804		220·86	
	Sholapur	341,230	321,756	662,986		4,499		159·59	
	Belgaum	478,903	459,847	938,750		4,592		204·43	
	Dharwar	506,023	482,014	988,037		4,565		216·44	
	Kaladgi	417,638	398,399	816,037		5,696		143·26	
Konkan.	North Kanara	206,417	191,989	398,406	3,259,776	4,235	13,580	94·07	6,024·17
	Ratnagiri	491,116	528,020	1,019,136		3,789		290·09	
	Kolaba	178,047	172,358	350,405		1,482		236·44	
	Bombay City	399,716	244,689	644,405		22		29,291·13	
	Thana	439,176	408,248	847,424		4,052		209·14	
Guzerat.	Surat	304,246	302,841	607,087	2,817,359	1,588	10,082	382·30	299·31
	Broach	182,511	167,811	350,322		1,358		257·97	
	Kaira	419,142	363,591	782,733		1,561		501·43	
	Panch Mahâls	129,770	117,810	247,580		1,731		139·08	
	Ahmedabad	438,759	390,878	829,637		3,844		215·80	
Sind.	Karachi	240,146	183,349	423,495	2,192,415	14,091	46,599	30·05	52·09
	Haidarabad	397,800	324,147	721,947		9,053		79·75	
	Thar and Pakar	103,271	77,490	180,761		12,729		14·20	
	Shikarpur	424,528	351,699	776,227		8,813		88·08	
	Sind Frontier	50,463	39,522	89,985		1,913		48·37	
	Total	8,485,854	7,749,757	16,235,611		124,105		6,534·82	


UPPER SIND FRONTIER
JACOBABAD
SHIKARPUR
HYDERABAD
THURRACHEE
THAR & PARKAR
RAJPUTANA
KAIRA
PANCH MAHAL
AHMEDABAD
BARODA
INDORE
BROACH
KATHIAWAR
SURAT
KHANDESH
NASIK
DECCAN
THANA
AHMEDNAGAR
BOMBAY
POONA
KOLABA
SATARA
BELGAUM
DHARWAR
GOA
KANARA
BOMBAY PROVINCE
SHOWING DISTRICTS.
Vincent Brooks, Day & Son, Lith.

Besides the British districts, the Native States cover an additional area estimated at 76,168 square miles, with a population of 10,831,730 souls. The Portuguese possessions of Goa, Damán, and Diu, with an aggregate area of about 1146 square miles, and an estimated population of 428,955 souls, are also included within the geographical limits of this province.

The Bombay Province is bounded on the north by the Native State of Baluchistan, the Punjab Province, and the Native States of Rajputana; on the east by the Marhatta State of Indore, the Central Provinces, West Berar, and the dominions of the Nizam of Haidarabad; on the south by the Madras Province and the Native State of Mysore; on the west by the Arabian Sea; and on the north-west by Baluchistan.

Physical Aspects.

The province presents on the map the appearance of an irregular strip of land stretching along the eastern shore of the Arabian Sea, and extending up the lower portion of the Indus Valley. The continuous coast-line is only broken towards the north by the gulfs of Cambay and Cutch, between which lies the projecting peninsula of Kathiawar. The sea-board is generally rock-bound and difficult of access, though it contains many estuaries, forming fair-weather ports for vessels engaged in the coasting trade. Physically, Bombay may be roughly divided into two distinct portions, the Narbada forming the boundary line. To the north of that river lie Guzerat, Kathiawar, Cutch, and Sind; to the south the Marhatta country, including portions of the Deccan and the Karnatic, and the Konkan. The former of these tracts is for the most part a low plain of alluvial origin. In Southern Guzerat the valleys of the Tapti and Narbada form sheets of unbroken cultivation, but in Northern Guzerat the soil becomes sandy and the rainfall deficient. In Sind the surface is a wide expanse of desert sand, interrupted only by low cliffs or undulating sand-heaps. The geological formation is distinct from that of the rest of the Indian peninsula, consisting of limestone rocks, continuous with those found in Arabia and Persia. The latter of the two tracts is an upland country furrowed with high mountains and deep valleys, which intercept the rain-clouds of the monsoons and blossom with tropical verdure. The geological formation is composed of nearly horizontal strata of basalt and similar rocks, which naturally break up into steep terraces and hog-backed ridges, and have produced by their decomposition the famous "black cotton soil," unsurpassed for its fertility. Within this second tract, the Deccan, the Karnatic, and the Konkan are each marked by special features of their own. The Deccan, including Khandesh district, is an elevated plateau behind the Western Ghats. It is drained by several large rivers, along whose banks are fields of much fertility; but for the rest, the air is dry and the rainfall uncertain. The Karnatic, or country south of the Kistna River, is a plain of lower elevation, and contains wide expanses of black soil under continuous cultivation. The Konkan is the name of the narrow strip of land lying between the base of the Ghats and the sea. As a whole, it is a rugged and difficult country, intersected by numerous creeks and abounding in isolated peaks and detached ranges of hills. The cultivation consists only of a few rich plots of rice-land and gardens of cocoa-nut. The rainfall is excessive.

The outlying province of Sind is penetrated throughout its entire length from north to south by the Indus, whose overflowing waters are the sole means of distributing fertility through that parched region. Its season of flood begins in March and continues until September, during which time the discharge of water, calculated at 40,875 cubic feet in December, is said to increase tenfold. The entire lower portion of the delta is torn and furrowed by old channels of the river, for the surface is a light sand, easily swept away and redeposited year by year.

The most peculiar natural feature in the province is the Ran, or Gulf of Cutch. It covers an estimated area of 8000 square miles, forming the western boundary of the province of Guzerat; but when flooded during the rainy season, it unites the two gulfs of Cutch and Cambay, and converts the peninsula of Cutch into an island. In the dry season the soil is impregnated with salt, the surface in some places being moist and marshy, and in others strewed with gravel and shingle like a dry river-bed or sea-beach. Considerable tracts of marshy land are to be found in the province of Sind, caused by changes in the course of the Indus.

The climate of Bombay Province presents great varieties. In its extreme dryness and heat, combined with the aridity of a sandy soil, Upper Sind resembles the deserts of Arabia. The thermometer here has been known to register 130° F. in the shade. In Cutch and Guzerat the sultry heat, if not so excessive, is still very trying. Bombay Island itself, though in general cooled by the sea breeze, is oppressively hot during May and October. The Konkan is hot and moist, the fall of rain during the monsoon some-

times reaching 300 inches. The tableland of the Deccan above the Ghats possesses an agreeable climate, as also does the South Marhatta country. The south-west monsoon generally breaks about the first week in June, and pours down torrents of rain along the coast; it lasts up to October. In Sind the monsoon rains exert little influence. During the rains travelling is everywhere, except in Sind, difficult and unpleasant (Hunter's *Gazetteer*).

The Province of Bombay has an average breadth of about 350 miles, and a length of 1000, whilst the coast-line is 1300. "In so vast a territory, as might be expected, there are great diversities of aspect, of climate, of condition. There are whole districts which are one large garden, and there are trackless wastes where the very absence of life is oppressive. There are places where the rainfall may be marked by feet; there are others, where cents would measure it. The people, too, are of many races and many creeds, and they present the extremes of contrast; there is met a kindness of which the most winning feature is its simplicity, and there is a heartless cruelty that makes one shudder" (Report of Sanitary Commissioner for Bombay).

Cholera History, Statistical and Descriptive.

The annexed tabular statements, Nos. I. to VI., show the statistics of cholera mortality in the Bombay Province during the twenty years dealt with in this inquiry. They correspond in all details with the similar statements furnished for the Madras Province.

No. I.

STATEMENT *showing the Annual Total Deaths registered from Cholera among the Civil Population in each of the Districts of the Bombay Province from the year* 1865 *to* 1881.

Districts.	TOTAL CHOLERA DEATHS REGISTERED AMONG THE CIVIL POPULATION IN THE YEARS																
	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Khandesh . .	14,598	61	37	553	2,632	19	1,339	1,577	...	...	6,224	29	1,694	6,077	136	...	3,176
Násik . . .	?	?	?	?	835	53	1,451	1,893	...	...	2,812	333	1,963	871	134	55	1,461
Ahmednagar .	15,609	809	88	1,902	437	62	658	1,837	...	...	4,933	1,115	2,760	2,267	186	11	2,645
Poona . . .	9,114	161	9	686	1,706	214	243	3,613	...	2	4,646	719	3,673	3,601	100	461	1,412
Satara . . .	6,878	1,134	33	657	8,157	569	131	1,640	...	...	3,666	1,938	6,702	5,386	...	14	866
Sholapur . .	3,493	1,841	46	779	2,569	371	280	1,463	...	...	3,536	2,235	1,354	3,074	22	3	1,307
Belgaum . .	1,247	1,962	4	363	7,808	302	40	617	16	...	2,736	4,950	8,357	5,757	...	...	349
Dharwar . .	1,191	11,202	6	2	2,691	1	...	24	17	...	2,288	7,092	8,779	1,790	...	...	5
Kaladgi . . .	3,056	3,896	47	320	5,126	62	167	1,750	90	1	1,365	5,072	7,124	2,230	...	4	138
North Kanara.	327	859	74	66	531	4	...	...	...	...	47	929	2,804	74	...	...	2
Ratnagiri . .	2,250	217	124	159	218	185	663	91	15	...	909	206	3,125	559	26	...	484
Kolaba . . .	?	?	?	?	111	102	121	116	...	...	1,453	70	1,124	787	180	27	687
Bombay City .	2,887	332	128	218	789	386	294	191	92	19	834	374	2,510	1,165	323	30	529
Thana . . .	7,936	66	18	469	1,816	181	379	313	...	...	5,969	693	3,337	1,809	770	70	531
Surat . . .	9,463	152	10	121	2,098	20	12	454	12	4	965	1,132	978	1,726	509	4	2,751
Broach . . .	?	?	?	10	1,236	9	1	...	...	...	862	746	302	1,027	8	...	120
Kaira . . .	5,800	176	161	87	2,104	63	20	19	16	1	2,104	1,315	205	1,594	129	...	72
Panch Mahals.	?	20	14	13	1,524	6	2	30	3	...	1,089	263	176	4,130	...	4	...
Ahmedabad .	?	140	11	10	2,514	57	20	14	22	10	1,078	2,818	285	2,793	274	1	159
Karachi . . .	300	8	557	23	3,744	...	...	...	...	...	42	...	...	...	1,175	...	...
Haidarabad .	1,850	1	135	...	1,779	...	...	...	...	...	...	...	...	...	1,433	...	...
Thar and Pakar	...	...	...	...	737	...	...	...	...	...	6	88	...	26	74	...	...
Shikarpur . .	37	...	3,467	...	1,253	...	...	...	...	...	...	...	...	...	1,359	...	...
Sind Frontier .	...	...	191	...	...	...	...	...	...	...	...	...	...	...	99	...	...
Totals . .	86,636	23,037	5,160	6,448	52,415	2,666	5,821	15,642	283	37	47,555	32,117	57,252	46,743	6,937	684	16,694

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Bombay Province for the Twenty Years from* 1862 *to* 1881.

Years.	Cholera Deaths Registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera epidemic throughout the province, excepting Sind.															...	40·21
1863	Cholera subsiding everywhere.															...	39·41
1864	Cholera widely and severely epidemic, except in Sind.															...	30·81
1865	1,194	1,131	1,848	8,036	21,034	26,427	15,936	7,750	1,718	473	316	173	45,007	38,142	86,036	7·51	39·22
1866	160	1,026	2,489	2,705	4,105	3,905	2,036	3,610	2,043	748	128	82	12,555	10,150	23,037	1·85	37·27
1867	65	76	51	89	65	100	217	2,508	1,385	316	87	201	3,086	1,946	5,160	0·39	36·59
1868	64	60	61	61	70	79	404	872	1,287	1,980	1,045	455	3,800	2,648	6,438	0·50	37·36
1869	1,069	1,024	1,686	6,458	9,770	9,570	9,817	4,453	3,435	3,733	1,123	277	29,096	23,319	52,415	3·78	48·53
1870	62	25	30	25	56	67	41	158	265	586	898	453	1,195	1,471	2,666	0·20	40·37
1871	351	237	174	137	591	804	1,005	1,014	555	598	174	181	2,897	2,630	5,821	0·41	28·25
1872	61	82	113	237	1,098	3,127	3,932	3,991	2,145	611	174	71	8,374	7,268	15,642	1·03	41·38
1873	61	100	35	34	24	10	6	3	3	3	2	2	165	118	283	0·02	35·79
1874	2	...	4	8	13	1	3	1	3	2	...	...	24	13	37	0·002	48·46
1875	1	1	10	795	5,359	10,374	12,906	8,609	3,493	3,548	1,640	819	?	?	47,555	2·93	43·42
1876	899	1,453	3,519	3,773	5,312	4,168	4,428	3,371	1,421	858	833	2,087	17,559	14,558	32,117	1·91	30·06
1877	3,734	4,488	6,887	8,114	8,299	8,320	7,673	5,143	1,874	1,110	813	797	31,344	25,908	57,252	3·54	31·83
1878	735	616	1,586	6,415	9,964	10,950	7,891	5,928	1,882	434	254	88	25,076	21,667	46,743	2·89	58·46
1879	78	18	21	64	1,176	2,684	1,088	510	401	541	183	173	4,007	2,930	6,937	0·43	39·04
1880	418	110	15	18	4	2	2	8	10	3	2	92	351	333	684	0·04	36·83
1881	79	47	23	20	344	1,499	2,618	6,568	3,327	1,403	500	266	8,684	8,010	16,694	1·01	36·60
Means	531	617	1,091	2,176	3,958	4,829	4,117	3,206	1,485	997	481	366	12,076	10,069	23,854	1·67	38·99

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the Bombay Province in Inches and Cents for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	RAINFALL IN INCHES AND CENTS IN THE MONTHS OF												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	0·09	0·03	0·05	0·17	0·15	9·85	9·26	8·23	9·69	2·26	0·38	0·05	40·21
1863	0·08	0·01	0·30	0·35	0·20	13·59	12·39	6·23	4·55	1·55	0·00	0·16	39·41
1864	0·06	0·02	0·02	0·17	0·33	10·03	10·25	5·97	3·13	0·33	0·48	0·02	30·81
1865	0·29	0·20	0·26	0·90	1·02	5·56	8·43	16·80	3·13	2·06	0·38	0·19	39·22
1866	0·10	0·01	0·04	0·00	0·08	6·67	13·97	11·63	2·42	2·25	0·10	0·00	37·27
1867	0·00	0·00	0·09	0·10	0·18	7·66	10·08	9·88	4·19	4·00	0·40	0·01	36·59
1868	0·09	0·16	0·14	0·16	0·64	9·64	11·28	11·98	2·68	0·48	0·05	0·06	37·36
1869	0·28	0·10	0·35	0·08	0·89	8·43	13·37	9·99	10·88	2·99	0·46	0·71	48·53
1870	0·12	0·00	0·17	0·18	0·52	10·24	13·59	5·22	5·75	4·45	0·10	0·03	40·37
1871	2·06	0·06	0·03	0·29	0·92	5·80	7·36	6·24	3·53	0·96	0·95	0·65	28·25
1872	0·05	0·00	0·07	0·29	0·41	11·12	14·45	5·32	8·13	0·80	0·02	0·72	41·38
1873	0·14	0·18	0·01	0·23	1·15	7·32	10·38	9·50	5·36	0·94	0·54	0·04	35·79
1874	0·07	0·10	0·00	0·16	1·47	10·19	19·66	6·79	8·37	1·50	0·12	0·03	48·46
1875	0·04	0·26	0·15	0·25	0·40	10·32	14·26	6·52	9·84	0·88	0·21	0·29	43·42
1876	0·03	0·01	0·26	0·13	0·08	6·03	13·65	6·66	3·02	0·13	0·06	0·00	30·06
1877	0·14	0·37	0·11	0·55	0·36	9·53	4·50	5·05	5·97	4·58	0·20	0·47	31·83
1878	0·03	0·05	0·02	0·31	0·64	8·77	16·35	17·99	10·41	3·02	0·86	0·01	58·46
1879	0·00	0·16	0·11	0·10	2·98	9·98	7·15	12·49	3·40	2·22	0·44	0·01	39·04
1880	0·00	0·11	0·16	0·15	0·48	7·61	11·69	3·74	9·47	2·81	0·59	0·62	36·83
1881	0·00	0·02	0·06	0·72	0·69	4·51	14·09	9·24	4·52	1·44	1·29	0·02	36·60
Means	0·18	0·09	0·12	0·26	0·68	8·64	11·80	8·77	5·92	1·98	0·38	0·14	38·98

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the Bombay Province, together with Average Strength and Ratio of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Total.			Ratio per Mille.	
		Cholera.			Cholera.			Cholera.			Cholera.			
	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Admissions.	Deaths.
1862	8,126	?	36	...	...	...	2,819	95	48	...	...	...	...	...
1863	8,441	?	7	...	...	...	3,074	4	...	...	...	...	...	...
1864	8,873	17	8	18,767	?	114	3,421	119	39	...	...	...	...	...
1865	8,345	210	108	19,070	197	100	6,883	?	64	34,298	471	272	13·73	7·93
1866	8,567	10	9	19,791	15	8	6,984	?	6	35,342	31	23	0·88	0·65
1867	8,275	1	1	20,337	2	1	6,775	?	2	35,387	5	4	0·14	0·11
1868	6,811	13	8	20,502	21	10	6,777	24	7	34,090	58	25	1·70	0·73
1869	7,949	30	23	16,990	62	27	7,636	49	26	32,575	141	76	4·33	2·33
1870	7,270	1	1	22,532	1	1	7,870	1	...	37,672	3	2	0·08	0·05
1871	7,742	1	...	20,107	12	6	7,827	1	...	35,676	14	6	0·39	0·17
1872	7,151	9	8	19,029	15	6	8,105	5	2	34,285	29	16	0·84	0·47
1873	7,276	...	...	18,963	...	...	8,989	...	...	35,228	...	...	...	...
1874	7,874	3	2	18,201	1	...	9,425	...	...	35,500	4	2	0·11	0·06
1875	6,720	39	25	18,471	48	26	9,164	26	7	34,355	113	58	3·29	1·69
1876	6,518	5	2	17,819	52	23	8,738	18	8	33,075	75	33	2·27	1·00
1877	6,529	17	12	18,461	67	43	11,452	83	42	36,442	167	97	4·58	2·66
1878	6,990	16	11	17,048	69	42	13,091	211	93	37,129	296	146	7·97	3·93
1879	6,433	4	3	13,104	9	7	12,827	64	27	32,364	77	37	2·38	1·14
1880	6,478	...	...	11,979	1	...	11,331	8	5	39,788	9	5	0·23	0·12
1881	6,032	6	3	14,180	49	33	9,839	62	37	30,051	117	73	3·08	2·04

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the Bombay Province during the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	8,126	4,865	?	?	...	...	...	...	2,819	1,964	4·84	50
1863	8,441	3,797	?	?	...	...	...	...	3,074	789	0·51	...
1864	8,873	5,778	0·29	47	18,767	10,883	?	?	3,421	2,107	5·65	33
1865	8,345	6,339	3·31	51	19,070	13,314	1·48	50	6,883	4,879	?	?
1866	8,567	3,753	0·27	90	19,791	4,627	0·32	53	6,984	1,138	?	?
1867	8,275	256	0·39	100	20,337	3,330	0·06	50	6,775	428	?	?
1868	6,811	2,882	0·45	61	20,502	7,638	0·27	48	6,777	1,164	2·06	29
1869	7,949	3,855	0·78	77	16,990	6,004	1·03	43	7,636	2,885	1·70	53
1870	7,270	453	0·22	100	22,532	2,162	0·05	100	7,870	390	0·26	...
1871	7,742	184	0·54	...	20,107	4,732	0·25	50	7,827	259	0·38	...
1872	7,151	2,925	0·31	89	19,029	7,825	0·19	40	8,105	1,441	0·35	40
1873	7,276	...	...	...	18,963	...	...	...	8,989	...	...	...
1874	7,142	2,202	0·13	67	18,201	652	0·15	...	9,425	...	...	...
1875	6,720	3,387	1·15	64	18,471	4,446	1·08	54	9,164	2,029	1·28	27
1876	6,518	3,289	0·15	40	17,819	4,851	1·07	44	8,738	1,440	1·25	44
1877	6,529	3,749	0·45	70	18,461	11,358	0·59	64	11,452	6,458	1·28	51
1878	6,990	2,938	0·54	69	17,048	12,859	0·54	61	13,091	7,693	2·74	44
1879	6,433	3,235	0·12	75	13,104	5,385	0·17	78	12,827	5,200	1·23	42
1880	6,478	...	...	...	11,979	103	0·97	...	11,331	354	2·26	62
1881	6,032	2,308	0·26	50	14,180	4,032	1·21	67	30,051	8,527	1·37	62

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera as represented by the Death-rates registered among the Troops and Jail Populations, and among the Civil Population, in the Bombay Province, for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Millet.*

Years.	Cholera Death-rate per 1000 of Strength or Population.					Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Cents per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Population.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	4·43	?	17·03	7·65	?	40·21	0·17	10·17	27·18	2·69	22·39
1863	0·83	?	...	0·61	?	39·41	0·39	14·14	23·17	1·71	17·80
1864	0·90	6·07	11·40	5·18	?	30·81	0·10	10·53	19·35	0·83	11·12
1865	12·94	5·24	9·30	7·93	7·51	39·22	0·75	7·48	28·36	2·63	13·84
1866	1·05	0·40	0·86	0·65	1·85	37·27	0·15	6·75	28·02	2·35	16·08
1867	0·12	0·05	0·29	0·11	0·39	36·59	0·09	7·94	24·15	4·41	17·59
1868	1·17	0·49	1·03	0·73	0·50	37·36	0·39	10·44	25·94	0·59	20·99
1869	2·89	1·59	3·40	2·33	3·78	48·53	0·73	9·40	34·24	4·16	14·71
1870	0·14	0·04	...	0·05	0·20	40·37	0·29	10·94	24·56	4·58	15·09
1871	...	0·30	...	0·17	0·41	28·25	2·15	7·01	17·13	1·96	17·88
1872	1·12	0·31	0·25	0·47	1·03	41·38	0·12	11·82	27·90	1·54	17·82
1873	...	...	...	...	0·02	35·79	0·33	8·70	25·24	1·52	21·71
1874	0·28	...	...	0·06	0·002	48·46	0·17	11·82	34·82	1·65	25·20
1875	3·72	1·41	0·76	1·69	2·93	43·42	0·45	10·97	30·62	1·38	23·69
1876	0·31	1·29	0·91	1·00	1·91	30·06	0·30	6·24	23·33	0·19	19·86
1877	1·84	2·33	3·67	2·66	3·54	31·83	0·62	10·44	15·52	5·25	22·83
1878	1·57	2·46	7·10	3·93	2·89	58·46	0·10	9·72	44·75	3·89	10·52
1879	0·47	0·53	2·10	1·14	0·43	39·04	0·27	13·06	23·04	2·67	11·84
1880	...	...	0·44	0·12	0·04	36·83	0·27	8·24	24·90	3·42	18·81
1881	0·50	2·33	3·76	2·43	1·03	36·60	0·08	5·92	27·85	2·75	24·15

No. VI.

STATEMENT *showing the Annual Rainfall in one and the same Station in each District of the Bombay Province for the Twenty Years from* 1862 *to* 1881.

Districts.	Stations.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Khandesh .	Dhulia . .	14·55	10·73	9·89	15·98	13·30	16·40	9·16	20·44	24·61	9·57	23·89	30·00	23·66	19·68	12·73	22·96	38·93	20·37	23·06	16·04
Násik . . .	Násik . . .	31·76	25·54	16·08	28·34	23·67	27·00	20·01	28·38	32·09	20·30	25·41	22·21	35·54	34·69	17·71	19·24	51·96	36·08	20·03	22·44
Ahmednagar.	Ahmednagar.	27·02	20·17	20·22	25·10	21·44	28·24	17·05	31·59	46·82	18·97	28·15	31·05	31·25	19·82	8·99	25·09	24·81	28·67	20·14	17·88
Poona . . .	Poona . . .	33·43	22·78	22·34	34·27	23·34	30·98	38·14	27·63	37·79	28·92	22·87	26·58	39·06	40·25	15·34	21·48	33·58	27·11	21·02	17·23
Satara . . .	Satara . . .	34·41	46·39	45·90	40·00	30·70	38·30	40·93	38·24	53·49	40·91	40·32	41·94	45·76	55·24	33·89	30·27	44·62	40·28	28·68	35·92
Sholapur . .	Sholapur . .	23·74	23·33	23·30	23·43	26·00	27·57	26·32	35·78	35·03	13·09	37·61	28·33	34·67	24·73	10·57	36·28	68·03	23·06	36·02	22·80
Belgaum . .	Belgaum . .	57·35	46·80	44·05	51·18	52·14	43·32	56·44	54·78	62·34	40·74	50·99	45·41	63·62	63·61	35·91	46·82	53·97	54·91	35·17	44·05
Dharwar . .	Bijapur . .	14·50	13·54	25·44	10·70	8·89	26·70	16·64	26·96	20·85	12·10	23·40	17·57	34·64	13·82	5·61	40·72	34·65	27·52	27·16	22·78
Kaladgi . .	Kaladgi . .	*23·51	*23·51	*23·51	*23·51	11·81	7·54	15·98	31·04	*23·51	*23·51	26·44	15·73	35·30	23·14	17·07	23·51	23·51	23·21	28·84	20·04
North Kanara	Karwar . .	144·78	130·23	89·92	106·49	106·49	122·71	102·46	139·36	97·55	81·59	135·50	76·60	149·42	110·34	88·09	87·06	193·33	130·32	96·54	96·63
Ratnagiri . .	Ratnagiri . .	106·10	97·61	101·88	113·91	108·21	93·93	90·12	103·50	95·27	75·30	85·87	83·64	123·13	119·07	58·34	85·15	162·83	97·52	100·96	82·06
Kolaba . .	Observatory .	73·63	77·68	45·57	77·85	78·44	62·30	62·12	91·66	66·21	40·58	76·48	69·70	82·18	84·56	50·01	73·15	112·77	61·40	67·94	73·04
Bombay City	Byculla . .	76·56	80·11	56·00	73·46	92·39	80·43	78·43	115·39	79·37	47·20	90·14	87·42	93·56	88·08	58·93	70·76	73·41	73·41	71·23	77·25
Thana . . .	Thana . . .	81·69	97·50	76·00	92·58	94·94	108·45	92·48	105·61	93·68	61·44	86·06	96·24	130·96	98·22	83·18	61·99	100·16	100·16	86·15	91·46
Surat . . .	Surat . . .	*47·64	33·93	20·34	47·48	39·87	35·14	38·51	53·48	40·93	24·64	53·75	47·43	41·80	45·61	49·68	16·73	89·31	35·23	32·50	29·87
Broach . .	Broach . .	32·58	50·77	21·00	31·25	33·02	32·98	43·62	44·32	27·17	20·04	36·20	35·35	39·56	56·84	32·38	20·41	67·85	41·51	57·54	43·88
Kaira . . .	Kaira . . .	33·19	27·79	15·69	24·31	27·20	20·09	38·70	33·38	37·69	33·56	32·95	22·86	23·22	35·76	30·38	26·34	42·18	26·48	59·10	47·73
Panch Mahals	Godhra . .	*44·53	*44·53	*44·53	*44·53	27·71	35·15	41·71	59·04	46·51	44·67	48·24	32·58	45·74	46·34	49·80	18·15	64·14	44·62	29·13	42·79
Ahmedabad .	Ahmedabad .	28·18	28·04	19·43	26·92	27·14	18·33	46·43	34·30	28·16	32·01	33·24	23·50	40·30	23·61	22·13	21·65	47·89	31·86	28·69	33·84
Karachi . .	Karachi . .	4·87	13·90	6·28	7·06	13·72	2·41	3·58	28·45	4·65	0·48	7·60	2·50	8·54	9·51	5·40	2·09	23·83	1·92	4·09	10·02
Haidarabad .	Haidarabad .	*8·40	6·54	3·92	11·80	12·28	4·89	1·87	20·23	2·57	3·53	8·81	3·15	9·82	11·78	8·68	3·40	16·45	3·29	2·47	14·43
Thar & Pakar	Umarkot . .	†10·63	17·44	5·03	22·88	13·79	10·37	7·08	20·28	0·53	1·90	10·63	10·63	12·56	10·94	12·61	4·88	13·19	5·15	4·71	13·38
Shikarpur .	Shikarpur .	†7·06	3·25	0·93	4·65	4·93	3·85	4·17	8·93	8·41	1·60	1·01	4·07	10·39	4·15	7·50	3·18	10·27	1·61	1·26	2·28
Sind Frontier	Jacobabad .	4·94	3·75	2·37	3·56	3·13	0·97	4·89	12·05	3·79	1·34	7·77	4·35	8·54	3·39	6·61	2·59	11·44	1·31	1·59	0·72

* The average of five years from 1872 to 1876.

† The average of five years from 1874 to 1878.

The explanation already given of the corresponding statements relating to the Madras Province applies *mutatis mutandis* in this place also. I proceed, therefore, to give a brief account of the cholera in each year of the series as derived from the records of the several Annual Reports referring to this province.

1862.—There are no statistics to show the annual prevalence of cholera among the civil population of the Bombay Province until the year 1865. For this year and the two following the returns of the disease among the troops and jails and in the city of Bombay are the only guides available for judging of the incidence of cholera among the civil population. In 1862 cholera prevailed in epidemic form more or less severely throughout the province, excepting the districts of the Sind division. Among the European troops and jail populations (the returns for the Native troops not being available), taken together, the death-rate from this cause was 7.65 per mille of strength; for the two classes separately the rates were 4.43 and 17.03 respectively. The latter high ratio indicates considerable prevalence of the disease among the poorer classes of the general population. The cholera mortality registered during this year in Bombay city is shown in the tabular statement given in the history of the disease in 1866. By reference to that statement (p. 73) it will be seen that the cholera epidemic of 1862 in Bombay city was the continuation of an epidemic outbreak which commenced in the month of October of the preceding year, the deaths registered from the disease in that city having in 1862 risen to a total of 3164 from a total of 641 in the year before.

The rainfall of the year was about the average, or somewhat above it, and the staple food-grain was at ordinary rates, or somewhat cheaper.

1863.—There was a marked abatement in the prevalence of cholera in this year, so far as can be gathered from the few statistics available. Among the European troops the death-rate fell to 0.83, and among the jail populations there was no mortality from cholera recorded during the year. The course of the disease in Bombay city also shows a distinct abatement of epidemic activity. The figures of the monthly mortality registered (see tabular statement on p. 73) show that the epidemic of the preceding year had subsided to a minimum of mortality in February 1863; that in March the mortality increased, and in April the renewed activity of the disease became pronounced; that this activity continued through the succeeding months, until the maximum mortality of any month was attained in July; that the activity of the disease then declined, and continued steadily abating until November; and, finally, that the year closed with a fresh renewal of activity in December. The total mortality of the year was 2309 against 3164 in the year before. The monthly figures show the course of the cholera prevalence in this year to have been marked by a clearly defined abatement at the seasons of the spring and autumn equinoxes, and by a prominent increase during the seasons of the summer and winter solstices—the seasons respectively of the hot-weather and cold-weather rains. The rise in the prevalence of the disease at the close of 1863 (see statement) was continued with an alternate fall and rise through the intervening months until the following May, in which month the highest monthly mortality of the year was attained. Cholera then, coincidently with a failure of the south-west monsoon rains, rapidly declined through the succeeding months, and subsided to a minimum of prevalence in October; but it again suddenly resumed activity, and rose in prevalence with the advent of the season of the cold-weather rains, and continued increasing to the close of 1864, the deaths

registered in December being considerably more than double the number registered in November.

The rainfall in 1863 was considerably less than that of the preceding year, but it was still fully up to the average for this province. The prices of food, however, had risen much, and in many parts were very high.

1864.—Cholera in this year prevailed with very widespread and deadly effect in most parts of the province. The districts of Khandesh (together with the adjoining province of Berar) and Surat suffered very severely, as also did the Southern Konkan and Guzerat. The disease raged very severely at the Mhyji fair in Khandesh during February and March, and its virulence was attributed to the circumstance of a great number of the visitors having taken up their abode in the dry sandy bed of the river. In reply to a reference on this subject, the Bombay Sanitary Commission stated "that large experience in many countries had shown that moist localities favour the increase of cholera, and that the intensity of an epidemic visitation of that disease increased in geometric proportion with increasing depression of the various parts of the surface on which the community attacked was located."

With the exception of Sind, no division of the Bombay army escaped cholera in this year. The city of Bombay itself suffered severely throughout the year, and there was a disastrously virulent outbreak among the pilgrims assembled at the Purundharpur fair. The course of the disease in Bombay city in 1864 has already been noticed; its monthly progress is well shown in the tabular statement previously referred to.

The cholera death-rate of this year among the troops and jails together was 5.18 per mille of strength. The bulk of the mortality was contributed by the jail populations, among whom the death-rate was as high as 11.40; the Native troops also suffered severely, their death-rate from this cause being 6.07; among the European troops the disease fell less severely, their cholera death-rate being only 0.90. The severe incidence of the disease among the Native troops and jails may be taken as a safe index to the prevalence of cholera in this year among the civil population.

The year was one of drought and famine and a season of widespread distress. The rainfall was no more than 30.81 inches against 38.99, the average annual fall for the province. The average yearly price of the staple food-grain had risen to 11.12 sers the rupee against 22.39 sers, the average price in 1862.

1865.—Cholera continued to prevail with greatly increased severity throughout this year. The death-rate among the troops and jails rose to 7.93, and among the civil population was found to be 7.51. Among the European troops the incidence of the disease in this year was exceptionally severe, the death-rate having attained the high figure of 12.94, a ratio which is nowhere approached in the experience of any other year of our series, the other highest death-rates being 4.43 in 1862 and 3.72 in 1875. In this year there were altogether 210 admissions and 108 deaths from cholera, and out of the 22 stations occupied by the European troops 17 recorded the disease. The mortality was heaviest in the garrisons of Kirki and Poona, Ahmednagar, Karachi, and Bombay, whilst 21 of the 108 deaths occurred amongst troops marching. Among the Native troops the death-rate was 5.24, somewhat less than the ratio of the preceding year. Of the 30 stations occupied by the Native troops, 19 recorded cholera; there were altogether 197 admissions and 100 deaths. The stations of Karachi, Ahmedabad, Surat, Ahmednagar, Maligam, Baroda, and Poona contributed the highest numbers. Among the

jail populations the death-rate was 9.30, a marked decline from that of the year before, although still unusually high. Of the 29 jails in the province, 15 recorded cholera. The number of admissions is not given, but the deaths are set down at 64, of which 14 occurred in the Ahmedabad jail alone.

Among the civil population 86,036 deaths from cholera were registered; but the returns for the whole province are not complete for this year, those for the districts of Ahmedabad, Broach, and Panch Mahâls not being available. For the other districts the returns show a complete exemption from the disease in Upper Sind and in Thar and Pakar, and only a slight prevalence in Shikarpur and Karachi. In Haidarabad, however, cholera attained considerable epidemic force, but prevailed, apparently, only in the months of July, August, and September. In the Sind districts, as also in Khandesh, the disease appeared only after the setting in of the south-west monsoon. In Dharwar and Belgaum it appeared in April.

In all the other districts the death returns show signs of the subsidence of a previous year's epidemic during the early months of 1865, and its revival at the approach of the south-west monsoon season. In Thana and Ratnagiri cholera was more active in January than in any other district; and in all the districts of the Konkan there was a marked increase in the prevalence of the disease in May, and generally also through the two succeeding months. In August there occurred a general subsidence of cholera in all these districts, and it was continued to the end of the year. In North Kanara the disease persisted steadily throughout the year at a low rate of prevalence, but there was a distinct increase of activity in June, and this, with slight fluctuations, continued till the end of the year. The year 1865 began with 1194 cholera deaths registered in January, and ended with 173 in December. The spring minimum prevalence fell in February; the hot-weather maximum intensity was prolonged through the months of May, June, and July; during the rest of the year the disease continued steadily subsiding, with no sign of renewed activity towards its close.

The rainfall of the year was somewhat above the average, and food was somewhat cheaper, but prices still ruled very high.

1866.—There was a marked abatement in the prevalence of cholera in this year. The death-rate among the troops and jails fell to 0.65, and among the civil population to 1.85. The returns, whilst showing this great decline in the prevalence of cholera in this as compared with the preceding year, "at the same time afford proof that the disease is endemic throughout the province, except it may be in Sind." In some parts of the province, however, the cholera of this year prevailed with great severity.

In the Dharwar district, which suffered comparatively little in the preceding year, the disease prevailed with greater severity than in any other district of the province, the deaths having risen to 11,202 from 1191 in the year before. In Belgaum and Kaladgi the disease was equally prevalent in both years, but in all the other districts a very marked subsidence took place. In Haidarabad and Karachi the disease lingered on until April, and then entirely disappeared. This is noteworthy, because in the following year, with an unbroken decrease in all other parts of the province, all the Sind districts, excepting only Thar and Pakar, were visited by a sharp outbreak of cholera, which, commencing in Shikarpur in July, continued until the end of the year in Karachi.

In Dharwar cholera appeared in April 1865, and prevailed with some activity until August, when it declined, and fell to a minimum in September. In October there was no sign of the disease, but it again appeared with some

force in November, somewhat abated in December, but rose again in January 1866, and in the months succeeding acquired considerable epidemic violence; the maximum intensity was attained in May; thence onwards the disease steadily abated, and disappeared entirely in November. At the close of the year cholera had subsided everywhere, and had disappeared entirely from several of the districts. The year 1866 opened with 160 deaths registered from cholera in January, and closed with 82 in December. The maximum mortality lasted from May to August, both inclusive, but with a clearly marked fall in July. The epidemic of the year commenced in February and ended in October.

In the city of Bombay the cholera of 1866 continued at a low rate of prevalence all through the year, but with a sensible tendency towards increase during the season of the hot-weather monsoon rains; towards the close of the year this increase abated, and the abatement was continued through the following year. The annexed tabular statement (derived from Bryden's Cholera Report of 1876) shows the cholera deaths registered monthly in the island of Bombay from 1848 to 1866 inclusive. It may serve as an index to the probable general course of the prevalence of the disease in other parts of this province during the period of these nineteen years.

STATEMENT *showing the Number of Deaths from Cholera registered in the Island of Bombay during each Month of the Nineteen Years from* 1848 *to* 1866.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1848	...	11	7	17	10	9	6	2	2	...	5	...	69
1849	...	...	1	4	1	...	...	121	690	369	260	682	2,128
1850	141	53	269	607	296	259	324	348	143	51	53	453	2,997
1851	1,873	905	1,013	601	373	339	73	37	25	19	20	207	5,485
1852	408	91	160	271	149	151	165	66	19	10	6	24	1,520
1853	23	3	13	5	16	9	6	6	6	250	571	246	1,148
1854	214	299	372	724	520	950	317	68	14	11	9	9	3,507
1855	60	22	22	302	585	273	167	52	75	46	21	20	1,645
1856	154	266	241	358	280	197	89	22	19	38	40	142	1,846
1857	459	165	306	363	249	302	157	86	32	31	18	13	2,181
1858	19	9	8	15	11	9	5	8	11	6	7	7	115
1859	9	10	9	7	69	843	329	170	41	85	131	282	1,985
1860	289	332	396	321	163	107	89	128	51	47	29	9	1,961
1861	15	18	5	4	12	18	13	10	11	34	35	466	641
1862	625	240	339	260	367	218	117	95	161	272	201	269	3,164
1863	189	50	89	161	153	161	412	240	178	181	176	319	2,309
1864	622	401	302	680	837	395	371	354	232	88	137	431	4,847
1865	363	540	522	356	624	206	116	62	31	32	22	13	2,887
1866	13	15	12	16	21	15	27	43	63	49	31	27	332
Totals	5,476	3,430	4,086	5,072	4,736	4,461	2,783	1,915	1,804	1,619	1,772	3,613	40,767

For the continuation of this tabular statement during subsequent years, see the cholera history of 1881.

The total monthly mortality of these nineteen years shows the spring minimum prevalence of cholera to fall in February and the autumn minimum in October; whilst the two months of maximum prevalence are January and April, but with a period of prolonged active prevalence from March to June inclusive for the hot-weather months, and a lesser period from December to February for the cold-weather months; the period of least prevalence of the disease extending from August to November inclusive.

The rainfall in 1866 was less than that in the year before; it was also slightly below the average. There was a sensible improvement in the prices of food, but rates still ruled high.

1867.—There was a continued abatement in the prevalence of cholera during this year. The incidence of the cholera of 1867 among the troops and jails in this province is shown in tabular statements Nos. III. and IV. at the head of this section. Compared with the results of the two preceding years, cholera in this year sunk to a minimum of prevalence in all parts of the province, excepting the districts of the Sind division. In these last the autumnal epidemic of 1865 had entirely ceased before the close of that year, and the division was almost completely exempt from cholera throughout 1866; but in this year all the districts of the Sind division, excepting only Thar and Pakar, suffered more or less severely from the disease. The Sind districts, in fact, were the only portions of this province in which the cholera of 1867 prevailed in epidemic form; and here the disease manifested activity only during the season of the south-west monsoon rains. This fact is of notable importance, because such a season in the hot, dry climate of Sind would be, in years when the south-west monsoon reaches its area in force, one of most active and unusual evaporation from the soil. In this respect, owing to its more northern latitude and very different climate, the delta of the Indus differs from the deltas of the great rivers of Bengal and Madras in the effects of the monsoon rains upon its soil. In the hot and arid soil and air of the Sind delta the monsoon rains are rapidly dissipated by absorption in a parched sandy soil and by evaporation in a dry atmosphere; whereas, on the contrary, in the moist, hot soil and air in the deltas of the great rivers of Bengal and Madras, the monsoons operate to intensify the existing conditions by producing saturation to excess of moisture both in soil and air—a state of affairs which retards the activity of evaporation during the period of their endurance. In these last, as soon as the equilibrium of humidity in soil and air is destroyed by the cessation of the monsoon rains or termination of the monsoon season diminishing the humidity of the atmosphere, the activity of evaporation from the soil commences, and finds freer scope in proportion to the dryness of the atmosphere.

The rainfall of the year was, on the whole, below the average. In the Sind districts the rainfall was also less in this than in the preceding year, but it fell only in the months—later months—of the south-west monsoon. Food was, if anything, slightly cheaper than in the preceding year, but prices still ruled high.

1868.—Cholera continued persistent during this year at a low rate of prevalence, and with an unimportant increment upon the death-rates of the preceding year. Among the troops and jails the death-rate rose to 0.73 from 0.11 in the year before (see tabular statement No. V.), and among the civil population to 0.50 from 0.39 respectively. In reality, however, so far as concerns the peninsula districts of the province, the increase of cholera prevalence was greater in 1868 than is indicated by the above general death-rates; because in 1867 the bulk of the mortality registered—viz., 4350 out of the 5160 deaths—was contributed by the Sind division alone, whereas in 1868 this division contributed only 23 out of the total of 6448 deaths registered. The cholera of 1867 in the Bombay Province was confined as an epidemic to the Sind districts, which, from their geographical position, came under the influence of the great cholera epidemic which in that year overspread the Punjab and Northern India generally, whilst in the rest of the Bombay Province the disease was at a minimum of prevalence. The cholera

of 1868, on the other hand, commenced activity in the peninsula districts of the Bombay Province—in the Deccan districts more particularly, those of the Sind division remaining wholly exempt from the disease throughout the year, with the exception only of a few last cases of the preceding year's epidemic, which passed on and finally ceased in January 1868 in Karachi.

The returns for 1868 show that the cholera of that year in the Bombay Province prevailed in epidemic form only in the districts of the Deccan plateau and those of Thana and Bombay city on the western coast, and that in these the activity of the disease was manifested mostly during the season of the south-west monsoon, the commencement of the activity occurring in July, and its abatement in October—coincidently with the commencement and abatement respectively of the south-west monsoon. The returns show the commencement of the cholera activity of 1868 to have occurred in the district of Ahmednagar in June to July, in Khandesh and Poona in August, in Satara and Sholapur in September, and in Belgaum, Kaladgi, Bombay city, and Thana in October. In Surat there was a sensible increase in the activity of the disease in November; but the other districts of the Guzerat division, as well as those of the Sind division, show a general exemption from cholera, though in Kaira its presence is declared throughout the year by a few deaths recorded in each month.

Practically the cholera of 1868 in this province was confined as an epidemic to the districts of the Deccan division, no less than 5262 out of the total of 6448 deaths of the year being registered in the 8 districts of this division (and of which 8 Dharwar returns only 2 deaths) out of the 24 districts in the province. In these Deccan districts Ahmednagar alone shows a persistence of cholera throughout the earlier months of the year. In all the other districts of this division the disease appears to have been entirely absent during some months prior to the advent of the south-west monsoon rains, excepting Poona, where cholera was nearly as persistent through the earlier months as in Ahmednagar. The provincial returns for 1868, like those for the preceding year, show a marked tendency towards a rise in the prevalence of cholera at the close of the year. In 1867 the deaths in January were 45 against 201 in December; in 1868 the figures were 64 and 435 respectively. This is just the reverse of what the returns show to have been the case in the two preceding years; in 1865 the deaths in January being 831 against 160 in December, and in 1866 the numbers being 147 and 55 respectively.

The rainfall of this year was slightly above that of the preceding, but still below the average. The prices of food had greatly improved, and rates were cheap.

1869.—Cholera in this year broke out afresh upon a new epidemic course. The death-rate among the troops and jails rose to 2.33 (see tabular statement No. V.), and among the civil population to 3.78. The monthly returns of cholera mortality among the civil population for this year, compared with the corresponding returns for the year before, show that the disease increased enormously in prevalence in all the districts excepting the Upper Sind Frontier, which remained exempt throughout the year, and Ahmednagar and Ratnagiri, in both of which the disease had already maintained a steady persistence during the two preceding years, and still lingered at a low rate of prevalence throughout this year also. In both of these districts cholera appeared to be dying out at the end of the preceding year, though in each, as in this year also, a small increment in the mortality took place during the months of the south-west monsoon season.

The cholera of 1868, which commenced its epidemic activity in the Deccan districts of Ahmednagar, Khandesh, Poona, Satara, Sholapur, Belgaum, and Kaladgi successively during the season of the south-west monsoon, had in each of them run its epidemic course—which was shorter in proportion as the disease was later in its appearance—and commenced to abate after the close of the monsoon season. In November this tendency to subsidence is clearly marked in the death returns of all these districts, and in December the abatement is very decided in all of them excepting Belgaum, in which district there was a slight rise. In the Konkan, the city of Bombay alone showed a marked rise in the prevalence of cholera at the close of 1868; in the Thana district adjoining, the fall in December is very conspicuous; but in Surat, the next district to the north, there is a distinct rise in that month.

Thus at the end of 1868 we find cholera activity rising in force in the districts of Belgaum, Bombay city, and Surat; and in the beginning of 1869 we find the disease in epidemic prevalence in those same districts, and also in the districts of Satara, Thana, and Broach. At the same time there was an active commencement of cholera in the Dharwar district in the south of the Deccan. This last district, with the exception of two deaths registered in March 1868, showed no signs of the presence of the disease throughout that year. A few other districts show the presence of cholera in January 1869, but in no great force. The districts of Panch Mahâls and Ahmedabad in the Guzerat division, and all the districts of the Sind division, show no trace of the presence of cholera in January; nor do the districts of Nâsik, Kolaba, and Poona, excepting only a single death recorded in the last named in this month. Thus in January 1869, out of the 24 districts in this province, 10 remained free of cholera; the other 14 districts show cholera widely diffused in this month over the Deccan, Konkan, and Southern Guzerat, and generally active in all three divisions.

In the next month, February, the month of normal spring minimum of cholera prevalence, the commencing activity of the great epidemic of this year received a check, which is marked by a slight fall in the mortality, notwithstanding the spread of the disease into the two previously unaffected districts of the Guzerat division. In March this check is overcome, and activity is resumed in some of the previously affected districts—notably in Belgaum, Kaladgi, and Surat—with the effect of a well-marked rise in the general cholera mortality of the month. But it is not until the following month, April, the month of the normal hot-weather commencement of cholera activity in all parts of India, that the real epidemic force of the cholera of 1869 is displayed.

In April the disease acquired greatly increased force in most of the districts previously affected—in those of the Southern Deccan especially—and caused a gross registered mortality of 6458 deaths against 1686 in the preceding month. The force of the cholera epidemic of 1869 in this province was now established in all the previously affected districts, and in the following month it prevailed with increased intensity (yet within the previously affected districts), which is represented by a rise in the gross mortality during May to 9770 deaths registered. In June the epidemic commenced activity in the Poona district to the south, and in Thar and Pakar to the north, and at the same time maintained its force in most of the previously affected districts; the gross registered mortality of the month being 9570 deaths. In July the epidemic commenced in Khandesh, and in the previously unaffected district of Nâsik adjoining thereto, and the disease

appeared, also for the first time in this year, in the Kolaba district; at the same time cholera maintained its force in most of the previously affected districts, the gross mortality of the month being registered at 9817 deaths—the highest number registered in any one month of the year. In this month the cholera epidemic of 1869 attained its climax, and thereafter rapidly subsided in most of the earlier affected districts. In August the mortality fell to 4453, or less than half that of the preceding month; whilst more than one-fourth of the whole mortality was contributed by the district of Khandesh alone. In this month cholera appeared, for the first time in this year, in the Haidarabad district of Sind, and in the following month in the districts of Karachi and Shikarpur, adjoining thereto, on the south and north respectively.

In September the epidemic had abated everywhere in the previously affected districts, although Khandesh, Surat, and Ahmedabad still showed the disease in some force. The total mortality for the month is registered at 3435 deaths; of this number, 2414 were contributed by the Sind districts—the newly affected districts of Karachi and Shikarpur together yielding 1858 of the number. In October the epidemic had subsided everywhere, except in the Sind districts; and here also it subsided before the close of the year, the Karachi district alone showing the persistence of the disease in December, though rapidly declining. The year 1869 commenced with 1069 cholera deaths in January, and ended with 277 in December, and of this latter number 128 occurred in Karachi district. By reference to the Table No. II., it will be seen that the spring and autumn falls in mortality—in February and September respectively—are very clearly marked in the seasonal course of this year's epidemic, although that of the latter period is considerably marred by the later commencement of the Sind epidemic. Excluding the deaths in the Sind division, the autumnal fall in September becomes more strongly marked.

The rainfall of 1869 was very copious and largely above the average; it was also very generally distributed. Food in this year was very dear, and prices generally approached famine rates. In parts of the Deccan actual famine was felt, and there was severe famine in the Central Provinces adjoining the Bombay Province. Altogether the year 1869 was a very unhealthy season. It is recorded that diarrhœa was very prevalent both among the troops and jail populations and among the civil population in the Bombay Province during this year. Among the jail populations there were 29 deaths from diarrhœa in this year against 9 in the year before. Intermittent and malarious fevers also were extremely prevalent throughout the year 1869.

1870.—There was a sudden and remarkable subsidence in the prevalence of cholera in this year as compared with the year before.

In the districts of the Sind division there remained no trace of the severe epidemic of the later months of the preceding year. In Dharwar and North Kanara the disease, which had completely subsided at the close of 1869, was not again revived in 1870; only a single death being recorded in Dharwar in February, and 4 in North Kanara, viz., 1 in May and 3 in November. In Ratnagiri the mild cholera of 1869 persisted at the same low rate of prevalence throughout 1870, but at the close of that year showed a marked tendency to increase. In the districts of Belgaum, Kaladgi, Satara, Poona, Sholapur, Násik, Ahmednagar, and Khandesh the epidemic of 1869, which had either ceased entirely or subsided to a minimum of prevalence towards the close of that year, lingered on in some of these districts during the early months of 1870; but the disease reappeared in epidemic form in all these

districts during the later months of this year, and continued in considerable prevalence to its close. In Kaira cholera was persistent at a low rate of prevalence throughout 1870. In Surat, Ahmedabad, Broach, and Panch Mahâls the epidemic of the preceding year showed no tendency to resume activity in this, although cholera was more or less present in all these districts during the greater part of the year. In Thana and Kolaba, after complete disappearance for five and six months respectively, cholera reappeared at the commencement of the south-west monsoon season, and continued prevalent to the end of the year. In Bombay city the disease continued steadily persistent from the preceding year, and increased in prevalence towards the close of 1870. The year 1870 commenced with 62 cholera deaths registered in January, and closed with 453 in December. In the preceding year the reverse obtained, the corresponding figures being 1069 and 277. The rainfall in 1870 was much less than that of the year before, but was still above the average. Food continued very dear, and in some districts the rates were little less than famine rates.

1871.—Cholera still continued at a minimum of prevalence in this year, although the general results show a slight increment upon the death-rates of the year before.

The autumn epidemic of the preceding year in the Konkan and Deccan districts rapidly subsided in the beginning of 1871 in the Deccan districts, but was prolonged somewhat later in those of the Konkan, although in these also it was sensibly declining to a minimum of prevalence in March. In March the cholera of 1871 commenced epidemic activity in Nâsik district, and during the following months to August and September renewed activity in all the other Deccan districts, excepting Dharwar and Belgaum, and also in the Konkan districts, with the exception only of North Kanara, in which, as in Dharwar, there was no sign of cholera activity during the whole of this year. It is to the districts of these two divisions—the Deccan and the Konkan—that the epidemic cholera of 1871 was confined, and in them the disease continued prevalent, with more or less of moderate activity, to the close of the year. The most active prevalence of cholera in this year took place in the northern Deccan districts and in the Ratnagiri district of the Konkan, and in these principally during the season of the south-west monsoon. The Sind districts show no trace of the presence of cholera in 1871, whilst in the Guzerat districts the slight traces of the disease during the earlier months entirely disappear after the advent of the south-west monsoon season. The tendency in most of the districts at the end of 1871 is to a complete subsidence of cholera, except in the northern Deccan districts, where the disease was still active. The year commenced with 351 cholera deaths in January, and ended with 181 in December; the corresponding figures for the preceding year being 62 and 453 respectively.

The rainfall in 1871 was generally in defect and far below the average. The fall of the year was only 28.25 as the average for the province, against 38.98, the general annual average. Drought prevailed in most parts of the province. The prices of food, however, were cheaper than in the preceding year, but rates still ruled very high.

1872.—Cholera in this year recommenced a fresh course of epidemic prevalence, and caused a marked rise in the death-rates. As in the preceding year, so in this the districts of the Sind division remained completely exempt from cholera. In the districts of the other three divisions the course of the cholera of this year presents a very noteworthy similarity to that of the year before.

The cholera of 1870, which commenced epidemic activity only in August, and was already on the decline in November of that year, had subsided everywhere in the Deccan districts in March 1871, excepting only Násik. But in the Konkan districts—excepting North Kanara, which, with Dharwar in the Deccan division, remained entirely exempt throughout the year—the autumn epidemic of the preceding year continued with some inconsiderable activity during the early months of 1871, and in Bombay city and Ratnagiri maintained a persistent prevalence throughout the year, whilst in Kolaba and Thana the disease ceased entirely in April and March respectively. In the districts of the Guzerat division—unaffected by the epidemic of 1870—cholera lingered fitfully, and finally disappeared in July 1871.

The cholera of 1871 commenced epidemic activity in the month of March by a redoubled intensity of the disease already prevalent in the Násik district. In April it appeared in Khandesh, and in May in Ahmednagar, both adjoining Násik on the north-east and south-east respectively, and both of which enjoyed a marked immunity from the epidemic of the preceding year. In June the disease appeared in Poona, and received a fresh impetus in Ratnagiri, and in Násik attained its climax. In July cholera appeared in Sholapur, and attained its maximum intensity in Khandesh. In August it appeared in Satara and Thana, and in September in Kolaba and Kaladgi. In all these districts, with various fluctuations of prevalence, the disease continued more or less active to the close of the year, but with a general tendency to subsidence, except in Násik, where it recommenced activity in December. The year 1871 closed with 181 cholera deaths registered in December.

The cholera of 1872 commenced epidemic activity in the month of March by a sudden and marked increase of the disease already prevalent in the Sholapur district. The year opened with 61 deaths in January and 82 in February, on the close of the preceding year's epidemic. In March the number of deaths rose to 113. The districts showing the presence of cholera in the early months of the year are Násik, Satara, Sholapur, and Kaladgi in the Deccan, Kolaba and Bombay in the Konkan, and Surat in the Guzerat division; but only in the above-named Deccan districts and in Bombay city was the disease persistent throughout the year. In March a few cholera deaths were registered in Ratnagiri, and Kaira and Ahmedabad, in the Guzerat division, also show traces of the presence of the disease in the same month. The chief activity of cholera is shown in the Sholapur district, the deaths in March rising to 57 from 6 in the preceding month. The disease here increased rapidly, and attained its climax in June. Meanwhile, in April cholera revived in Satara and Násik, appeared for the first time in this year in Poona and Ahmednagar, and continued at its previous rate of prevalence in Kaladgi and Bombay city. In May cholera appeared, for the first time in this year, in Khandesh and Belgaum, received a very marked accession of force in Násik and Kaladgi, and progressed with epidemic increase in Poona and Ahmednagar.

In June cholera reappeared in Kolaba and Surat, and appeared, for the first time in this year, in Thana, but in none of them to any considerable extent; whilst in the Guzerat districts the slight traces of the presence of the disease during the preceding three months became more pronounced. The main force of cholera in this, as in the succeeding months, was confined to the Deccan districts, of which Dharwar alone, with North Kanara in the Konkan, preserved a complete immunity from the disease throughout the year, excepting only an isolated outbreak in Dharwar in November. The

epidemic cholera of 1872 was on the decline everywhere in October, and in November ceased entirely in most of the affected districts. In Kaladgi and Bombay city the disease was persistent throughout the year, though in each the epidemic increase during the season of the south-west monsoon ceased in October. In Poona, Belgaum, and Thana the monsoon epidemic lingered on to the close of the year, and in Thana showed a tendency to revival in December.

In 1872, as in 1871, the cholera of the year was a monsoon cholera, and in each year was confined to the districts of the Deccan and the Konkan. In 1872 Ratnagiri escaped a repetition of the epidemic it suffered in the preceding year; whilst Surat, which escaped the epidemic of 1871, suffered from that of 1872. In both years the other Guzerat districts escaped the epidemic, although they showed traces of the presence of cholera during the first half of each year.

Such are the main features of the general course of the cholera of 1872 in the Bombay Province. The course of the disease in the several districts varied considerably, but in most of those epidemically affected the influence of the south-west monsoon is clearly marked.

The rainfall of the year was above the average and fairly distributed. The returns show a considerable rainfall during the month of April in all the Deccan districts, but none in the other parts of the province, with the exception of a few slight showers in some of the Sind and Guzerat districts. In May the rainfall was markedly less than in the preceding month in the northern Deccan districts, but continued abundant in the southern districts of that division, especially in Dharwar, where the fall registered in May was 23.38 inches, following 18.51 inches registered in the month before. There was also abundant rainfall recorded during May in the Konkan districts of Thana, Ratnagiri, and North Kanara. In June the south-west monsoon rains were fairly established all over the province, excepting the Sind division. In July this division also was included in the general rainfall of the monsoon, and the rains continued with an apparently fairly distributed and abundant fall until the month of October, when they ceased everywhere, except in the Southern Deccan districts, where they seem to become continuous with the winter rains of December, which also were almost wholly confined to the Deccan districts and the southern portion of the Konkan.

Food in this year was still very dear, and prices ruled at much the same high rates as in the year before.

1873.—Cholera in this year subsided to a minimum degree of prevalence, and practically was absent from the province throughout the year. Among the troops and jails there was no mortality from the disease, and among the civil population the death-rate was only 0.02 per mille. Only 283 deaths from cholera were registered in this year against 15,642 in the year before. In 1873, out of all the deaths registered from all causes in this province, 1 out of 1028.17 was from cholera; in 1872 the proportion was 1 out of every 23.46 deaths. In 1873 only 1 out of every 57,369.65 of the population died of cholera; in 1872 the proportion was 1 out of every 963.35.

In the city of Bombay alone, out of the 24 districts of the province, did cholera maintain a steady persistence throughout the year. In all the districts which were free from cholera in 1872 there was no reappearance of the disease in 1873; and in all the districts of the province, excepting only Bombay city, there was no sign of the presence of cholera during the last three months of 1873. Out of the 24 districts only 9 showed signs of the presence of cholera, at one time or another, in 1873, and in each in very

mild prevalence; the other districts were entirely exempt all through the year. The year began with 61 cholera deaths in January, and ended with only 2 in December.

The rainfall of the year was much less than that of the year before, and also considerably below the average. There was, however, a great improvement in the prices of food, and rates were generally cheap.

1874.—Cholera in this year sank into absolute subsidence. Only 37 deaths from the disease among the civil population of the province were registered during the year. Among the troops and jails there was a like exemption from the disease (see tabular statements Nos. III. and IV.)

Of all the districts, Bombay city alone showed any sign of the persistence of cholera during 1874, and even here the disease was at the lowest ebb of prevalence, and entirely disappeared in November, 19 deaths only having been registered during the year. In Surat 4 deaths only were registered, 1 in each alternate month, from January to July inclusive. In Ahmedabad there were 10 deaths registered during the three months of March, April, and May. In Poona 2 deaths were registered, 1 in May and 1 in September. In Kaira and Kaladgi single deaths were registered in June and May respectively. With the exception of 2 deaths in Bombay city in October, there was no sign of the presence of cholera in any part of the province during the last three months of 1874. The year commenced with 2 cholera deaths in January, and the last recorded were 2 in October. The year 1874 closed with a complete absence of cholera from all parts of the province during its last three months, with the exception noted above.

The rainfall of the year was very abundant and much above the average. In quantity and general quarterly distribution it much resembled that of the year 1869. Food in this year was very cheap, cheaper than in any previous or subsequent year of the series with which this inquiry deals. In this respect the year 1874 differs strikingly from the year 1869, the average rates of the staple food-grain being 25.20 sers the rupee against 14.71 respectively.

1875.—Cholera in this year again started on a fresh course of epidemic activity. The death-rate among the troops and jails rose to 1.69, and among the civil population to 2.93. The returns for this year close the decade from 1866 inclusive, the year following that in which death registration was commenced among the civil population of this province. During this period of ten years the total number of cholera deaths registered among the civil population is 159,064, the annual mean is 15,906, and the ratio per 1000 of population is 1.11. The mortality registered in each year of the decade is shown below.

Years.	Cholera Deaths.	Ratio per 1000.	Years.	Cholera Deaths.	Ratio per 1000.
1866	23,037	1·85	1872	15,642	1·03
1867	5,160	0·39	1873	283	0·02
1868	6,448	0·50	1874	37	0·002
1869	52,415	3·78	1875	47,555	2·93
1870	2,666	0·20	Means	15,906	1·11
1871	5,821	0·41			

The point to be observed here is the repeated bound upwards in the mortality from cholera in each third year of the decade, beginning with 1866. Whether the same phenomenon of epidemic activity, decline, and subsidence in the successive years of each triennial cycle obtained in preceding decades there is no means of knowing. There is the fact, however, that in 1865, the year preceding this series of triennial periods, the total of cholera deaths registered in this province reached a maximum of 86,036.

What the conditions were which brought about or attended this high mortality there are no means of ascertaining with any degree of accuracy. In this same year 1865, however, cholera was widely prevalent and excessively fatal in the Madras Province. Death registration had not then been introduced among the civil population of that province, but it is recorded that in the Malabar district alone no less than 40,000 of the inhabitants died of cholera in 1865.

The returns for 1875 show a fresh revival of cholera activity in the Bombay Province, with greatly increased force over any previous year back to 1866 inclusive, excepting only the year 1869, in which the death-rate was higher. Comparing the returns for 1875 with those for the preceding year, we find all the districts abandoned by cholera in that year now again occupied by the disease in great intensity, with the exception of the districts of the Sind division generally. During the last three months of 1874 there was no sign of the presence of cholera anywhere in the Bombay Province, excepting only 2 deaths recorded during October in Bombay city.

In 1875 the first cholera deaths of the year were registered in Bombay city, viz., 1 in January and 1 in February. No other cholera deaths were registered during these two months in any part of the province. The next deaths registered from cholera occurred in March in the town of Násik. Regarding this appearance of the disease it is recorded—

"On the 22d March there was a case in the town of Násik, and from this date to the end of the month there were 10 others, which all ended fatally; in all there were 29 attacks. The first case was that of a Gosain, who had come from Dwarka, and at first it was thought he must have brought the disease with him, more especially as it is said he had diarrhœa for some days before he arrived. But neither at Dwarka nor at any intermediate place had there been a sign of cholera; and, after due inquiry on the spot, Dr. Cody (who was at Násik during the whole of the outbreak) inclines to the belief that it originated in the exposure, the irregularities, and the excesses of the Holi festival, which commenced on the 22d."

These 10 deaths registered at Násik in March 1875 were the only deaths registered from cholera in that month in the whole of the Bombay Province. But during April, whilst there were 959 attacks and 481 deaths at Násik, the disease appeared in 10 other districts, all in the northern parts of the Konkan, Deccan, and Guzerat divisions (see Table No. I.) In May cholera appeared in three other districts, Kolaba, Surat, and Broach. In June the disease appeared in Thar and Pakar and Satara, in July in Belgaum and Kaladgi, in August in North Kanara, in September in Dharwar, and in November in Karachi, at the opposite extreme of the province. In the other Sind districts there was no sign of cholera throughout the year, and in Karachi and Thar and Pakar it appeared only in very mild prevalence.

In all the other districts cholera quickly attained intense epidemic force, and reached its maximum intensity at different periods from first appearance in the different districts, and apparently quite independently of the general seasonal influences. Thus in Bombay city, after reappearance in April, cholera reached its climax in July; in Kolaba, appearing in May, it attained its maximum intensity in August; in Thana, appearing in May, the disease raged in maximum intensity during June, July, and August; in Ratnagiri, appearing in April, cholera did not reach its climax till August and September; in Khandesh, appearing in April, the maximum intensity was continued all through June and July; in Násik, appearing in March, cholera attained its climax in May; in Ahmednagar the corresponding months were April and June–July; in Poona, April and May–June; in Satara, June and August; in

Belgaum, July and October; and Kaladgi, July and September. In Sholapur cholera appeared in April, with a single death registered in that month. There was no death recorded in May, but in June the disease reappeared with 94 deaths in that month, and then the number bounded up to the maximum or climax, 2453 deaths in July; in August the number fell to 731, and thereafter steadily declined in the succeeding months. In Dharwar cholera burst out with virulence in September, and reached its climax in the following month. In Surat, appearing with a single death in May, cholera prevailed in intensity during June and July, and then declined. In Broach it appeared in May and culminated in June. In Kaira, appearing in April, it prevailed in intensity during May and June. In Panch Mahâls and Ahmedabad, appearing in April, cholera culminated in June.

In April, whilst cholera was spreading into other districts after its appearance at Nâsik, there was an outbreak of the disease at Baroda; but of this, being a Native State, there are no details recorded. When cholera first appeared at Nâsik in March, "there were then taking place numbers of caste dinners, wedding feasts, &c., and then came the Holi, with all its excesses; so here were causes for the bad form of diarrhœa which was said to be prevalent." For the monthly course of the epidemic cholera of 1875 in this province, see the Table No. II.

The rainfall of the year 1875 was much less than that of the preceding year; it was, however, as much above the average. Food was dearer somewhat than in the preceding year, but it was still unusually cheap.

1876.—In this year, as in the corresponding year of the three preceding triennial cycles, viz., 1866–68, 1869–71, and 1872–74, cholera abated very much from the activity of its prevalence in the year before, although the decline is neither so rapid nor so great as it was in the preceding cyclic periods referred to. The death-rate of the year fell to 1.00 from 1.69 in the year before, among the troops and jails, and to 1.91 from 2.93 respectively, among the civil population.

The epidemic cholera of the preceding year, which was still active at its close in the southern districts of the Deccan and the Konkan, and in the Guzerat districts of Surat and Kaira, as well as in the Thana district in the North Konkan, passed on into the following year in all these districts, excepting Kaira, in which the disease ceased activity with the close of 1875; and we find the year 1876 opening with cholera epidemic in Belgaum, Dharwar, and Kaladgi in the Deccan, in North Kanara, Ratnagiri, and Thana in the Konkan, and in Surat and Ahmedabad in Guzerat.

In Ahmedabad the epidemic of 1875 had ceased entirely in September of that year, no cholera death being registered during the three following months; so that the reappearance of the disease in this district in January 1876 may be considered as a fresh revival of cholera, which then ran an independent epidemic course here during the succeeding months, and did not finally cease until October. In Surat the epidemic of 1875, steadily declining after October of that year, had sunk to a minimum of prevalence in January 1876; but in the following month the disease resumed activity, and, running a second epidemic course, culminated in May, continuing a prevalent persistence, however, through the monsoon months up to the end of August; after this the disease rapidly abated, but lingered to the close of the year, its presence in December being marked by a single death in that month. In the other districts of Guzerat the cholera of 1876 was a monsoon manifestation of the disease, which, commencing in Kaira at the end of March, and in Broach and Panch Mahâls in April, ceased entirely in all three by September.

In the Southern Deccan districts the autumn cholera of 1875, which broke out in Dharwar in September of that year, and was still in active progress at its close, passed on into 1876 with increased activity as the commencement of a second epidemic, which, culminating in March, gradually subsided to a minimum in August; in the next month, however, the disease again resumed activity, and ran a third epidemic course, which attained its height in December. In Belgaum and Kaladgi the declining epidemic of the preceding year passed on into 1876 without any sign of renewed activity, such as is so markedly shown in Dharwar; but in February the renewed activity of cholera becomes very apparent in both districts. The disease thereafter ran an epidemic course, which culminated in May in each district, and then, slowly subsiding, fell to a minimum in September; in the next month, as had occurred a month earlier in Dharwar, cholera again renewed activity, and ran another epidemic course, which was at its height at the close of the year. The main force of the cholera of 1876 in this province centered in these three districts of the Southern Deccan. In all three the disease ran a singularly similar course, and collectively they contributed considerably more than half of the entire registered cholera mortality of the year in this province. In these three districts their third successive epidemic outburst of the disease was carried on in full force into the following year, and with greatly increased violence, as will be seen in the cholera history of 1877.

In the Konkan districts the cholera of 1876 made little progress. All the districts of this division, excepting Kolaba, show a more or less persistent prevalence of cholera during the greater part of the year, but in no great activity. In Ratnagiri and North Kanara the disease was most active during the earlier months of the year, and evidently partook of the influences affecting the course of cholera in Dharwar and Belgaum. But in Bombay city, Thana, and Kolaba the cholera activity of the year was essentially a manifestation coincident with the season of the south-west monsoon.

In the northern districts of the Deccan this is still more clearly marked. Cholera appeared, for the first time in this year, in Sholapur in May, in Satara and Poona in June, in Ahmednagar and Násik in July, and in Khandesh in August, thus showing an advance of the disease from the centre of epidemic activity in the southern districts towards the north in the succession of the districts according to their geographical position. In Khandesh and Násik the disease ceased activity in October, but in the other districts it continued active to the close of the year. The year 1876 commenced with 899 cholera deaths registered in January, and ended with 2087 in December. With the exception of 13 deaths returned from Thana and 1 from Surat, 53 from North Kanara and 2 from Ratnagiri, the whole 2087 were registered in the Deccan districts, excepting Khandesh and Násik, which had no cholera deaths in December; and by far the greatest proportion of these deaths was contributed by the three districts of Belgaum, Dharwar, and Kaladgi. Besides these three districts, North Kanara alone shows signs of revived cholera activity at the close of the year. Compared with those for the preceding year, the returns for 1876 show that the cholera epidemic which commenced at Násik in 1875, and had generally subsided towards the close of the year, except in the districts of Belgaum, Dharwar, Kaladgi, and Surat, was revived in 1876, and with most violence in the four districts above named.

The year 1876 was one of severe drought and high prices. The rainfall was much below the average, and was generally deficient in all the districts,

excepting those of Sind and Northern Guzerat. The prices of the staple food-grains were very high, and during the last half of the year approached famine rates in many of the districts. The annexed tabular statement shows the prices ruling in the latter half of 1876, in comparison with the ordinary prices, in the districts of the three divisions of the province affected by cholera in this year.

STATEMENT *showing the Average Ordinary Prices of the Staple Food-grains in each of the Districts—those of Sind exclusive—of the Bombay Province, as compared with the Prices prevailing in each during the last Fortnight of July, September, and December* 1876.

Divisions.	Districts.	Staple Grain. Ordinary Prices in lbs. per Rupee.		Prices in lbs. per Rupee for the fortnight ending					
				15th July.		30th September.		31st December.	
		Joari.	Bajri.	Joari.	Bajri.	Joari.	Bajri.	Joari.	Bajri.
Deccan.	Khandesh	56	54	48	44	45	36½	21	31
	Násik	54	47	49½	34	47	31½	19	33
	Ahmednagar	76	66	53	41½	34	31	17	27
	Poona	65	51	41	30	28	25	17	22
	Satara	39	35	37	31	24	23	18	21½
	Sholapur	66	60	50	41	35½	34½	18½	19
	Belgaum	43	54	36½	38	32½	34	16½	21½
	Dharwar	50	43	46	42	40	36	16	20
	Kaladgi	56	76	49	47½	32½	27½	13	16½
Konkan.	North Kanara	35	32	34	26	32	30	24	24
	Ratnagiri	38	38	?	23	28½	23	21	22½
	Kolaba	42	37	38	30	38	30	16	?
	Bombay City	40	31	40	30	40	30	19	26
	Thana	41	40	35½	28	35	28	18	26
Guzerat.	Surat	40	36	29½	29½	27	29	15½	22½
	Broach	40	36	33½	32	30	30	23	26½
	Kaira	51	43	35½	35	32	35	20	34
	Panch Mahals	53	47	66	46	66	46	?	?
	Ahmedabad	47	43	44	41	32	40	20	36

The rates show that the districts of Poona, Satara, Sholapur, Belgaum, Dharwar, and Kaladgi, in the Deccan, which suffered most severely from famine, also suffered most severely from cholera. In Khandesh and Násik, where the famine pressure was less severe, the cholera prevalence was also of low intensity. In Kolaba there was also slight prevalence of cholera, with slight rise in prices. In Panch Mahals, too, where prices were cheap, cholera, after appearing with considerable initial severity, made no head, but quickly subsided. In Broach and Kaira the disease had well-nigh subsided before the high prices set in. On the whole, the figures show that famine does distinctly tend to aggravate the mortality from cholera, or at least to predispose the sufferers by privation to the influence of cholera when that disease is abroad.

1877.—In this year cholera, instead of subsiding to a minimum of prevalence, as it had done in the corresponding year of the preceding triennial cycles, and as it also did in the next succeeding triennial cycle, prevailed with greatly increased intensity. The death-rate rose to 2.66 among the troops and jails (see tabular statements Nos. III. and IV.), and to 3.54 among the civil population. The number of deaths in 1877 exceeds the mean of the preceding ten years by 40,448, and, as in 1869, this excessive mortality was accompanied by famine. The ratio of recorded cholera deaths

to total of population and to total of all deaths is shown below for 1877 in comparison with the previous ten years. The ratio of male deaths from cholera in 1877 to male population is 3.71, and that of female deaths to female population 3.36. In the Ratnagiri, Kolaba, Surat, and Broach districts the death-rate of cholera of females exceeded that of males, but in all the other districts affected the heaviest death-rate is found among males. The cholera death-rate of the province in 1877 is slightly below that of the year 1869, but the death-rate in the year 1865, in which registration was first introduced, was fully double that of either of these years.

Years.	Cholera Deaths.	Rate per 1000 of Population.	Percentage to Total Deaths.
1867	5,160	0·39	3·17
1868	6,438	0·50	3·48
1869	52,415	3·78	18·43
1870	2,666	0·20	1·21
1871	5,821	0·41	2·08
1872	15,642	1·03	4·39
1873	283	0·02	0·10
1874	37	0·002	0·01
1875	47,555	2·93	12·66
1876	32,117	1·91	8·72
Means	16,804	1·11	6·13
1877	57,252	3·54	9·13

The cholera of 1876, which had raged in a succession of epidemic outbursts in the three southernmost districts of the Deccan ever since the commencement of the disease in them in the autumn of 1875, had, as we have seen, renewed fresh activity for a third epidemic course in those districts at the close of that year. The disease was also still active at that time in the other Deccan districts, excepting Násik and Khandesh, as a continuation of the epidemic which commenced in them during the season of the south-west monsoon; whilst, at the same time, it had renewed activity in the North Kanara district of the Konkan, in which the epidemic of the preceding year had run its course, and finally ceased in August 1876. The year 1876 thus closed with cholera in epidemic force in the three southern Deccan districts of Belgaum, Dharwar, and Kaladgi, in revived activity in the adjoining Konkan district of North Kanara, and in continued prevalence in the other Deccan districts, excepting Násik and Khandesh.

The year 1877 opened with cholera in full epidemic force in all the three southern Deccan districts and in North Kanara, and in more or less increasing activity in the other Deccan districts, excepting Násik and Khandesh. And these are the only districts in the whole province which showed the presence of cholera in January 1877, excepting only Bombay city, in which the commencing activity of the cholera of this year is indicated by a single death recorded in that month. The force of the epidemic at this time centered in the districts of Belgaum, Dharwar, and Kaladgi, which together contributed 3182 of the total 3734 deaths registered in January; but the disease, at the same time, showed signs of increasing activity in Poona, Sholapur, and North Kanara.

In February cholera continued with increasing activity in the districts named, and broke out also in Ratnagiri and Kolaba, whilst in Bombay city and Ahmednagar it started into fresh activity. In March the disease attained its climax in Belgaum and Dharwar, and was in active prevalence in all the other affected districts excepting Sholapur, where the disease received a check

in this month, but, recovering it in the following, ran a fresh epidemic course, culminated in June, and finally subsided in November. In April cholera culminated in Kaladgi and Satara, and also in North Kanara, and was still in high epidemic prevalence in Belgaum and Dharwar, whilst in the other affected districts it was progressing actively. At the same time the disease commenced activity in Násik and Thana, in the latter with an outburst in considerable force.

In May cholera attained its maximum intensity in Thana and Poona, and was still in high tide of activity in Satara, Belgaum, and Kaladgi, though somewhat less intense than in the previous months. The disease was increasingly active in the recently affected districts, whilst declining in some of the more early affected ones; at the same time it commenced an epidemic course in the Surat district, where it culminated in August, and finally subsided towards the close of the year. In June, without any fresh district being affected, excepting only 4 deaths recorded in this month in Panch Mahals, cholera attained its highest monthly mortality in this year; but the number of deaths was not much greater than that for each of the two preceding months, for the period of maximum intensity of the disease was prolonged over the three months April, May, and June. In July, although cholera commenced activity in Khandesh with considerable initial force, and appeared in epidemic form also in Broach, there was a sensible fall in the mortality of the month from the figures attained in June.

In August the decline in mortality is still more marked, and in September, the epidemic of the year having ceased in the early affected districts of the Deccan, the fall in the mortality is sudden and decided. In October cholera appeared in Kaira and Ahmedabad, but was steadily on the decline in all the other districts. In November the abatement of cholera was continuous, and the year closed with a general subsidence of the epidemic of the preceding months, the deaths registered in December being 797 against 3734 in January, at the commencement of the epidemic, and against 8320 in June, at its height. At the close of 1877 the only districts in which cholera showed a tendency to renewed activity in December were Belgaum and Thana, and in a lesser degree, Poona, Kolaba, and Bombay city; whilst in the later affected districts of Kaira, Panch Mahals, and Ahmedabad, the disease was still active in December, though on the decline from the higher prevalence attained in the preceding month.

The influence of the south-west monsoon season upon the course of the cholera of 1877 in this province is not at all clearly marked. The course of the disease appears to have been more directly influenced by the condition of the people in respect to their food-supply, since the districts which suffered most severely from famine were also those in which cholera prevailed with greatest severity. The intensity of the cholera of 1877 was manifested in the Southern Deccan districts during the first half of the year, before the advent of the monsoon season. In Khandesh, Surat, and Broach only was the commencement of cholera activity coincident with that of the monsoon season; and of all the districts affected, North Kanara alone shows a distinct accession of epidemic activity during that season. In this last district the spring epidemic had attained its maximum intensity in April, and was rapidly declining in the following month; but in June this decline was checked, in July activity was renewed, in August a second maximum of intensity was attained, and thereafter a steady decline set in, and continued to the close of the year. The Sind districts remained absolutely exempt from cholera throughout the year. They were entirely unaffected by the famine, and but

to a slight extent by the south-west monsoon—the rainfall in this year during that season being only little more than half the average fall. The great cholera epidemic of 1877 in this province expended its force in the Southern Deccan districts (Belgaum, Dharwar, and Kaladgi together contributing no less than 24,260 out of the total 57,252 deaths registered) and adjacent areas, and found its limit towards the north-west in the Ahmedabad district of Guzerat. In the following year this division of the province became a seat of active cholera prevalence. Excluding the Guzerat districts, in which the disease appeared only towards the close of the year, the cholera epidemic of 1877 had, at the end of the year, subsided to a minimum of prevalence in all the districts of the province, and had disappeared entirely from those of Khandesh, Dharwar, and Kaladgi. The only districts which, at the end of 1877, showed a tendency to the revival of the disease were Belgaum and Poona in the Deccan, and Bombay and Thana in the Konkan. The year 1877 began with 3734 cholera deaths registered in January, and ended with 797 in December; the corresponding numbers for 1876 were 899 and 2087 respectively.

From the details recorded concerning these returns it appears that the cholera of 1877 among the troops and prisoners in this province was influenced in its course by other causes than those which influenced the course of the epidemic of the year among the civil population, more especially in the districts most severely affected by the disease. In the latter the epidemic of cholera was accompanied by high prices and general distress for food among the poorer classes from the very commencement of the year, and to this circumstance must be attributed the greater intensity of the disease at that unusual season for its activity in those districts, more especially as among the troops and jails the cholera of 1877 followed the usual seasonal course as influenced by the south-west monsoon; the bulk of the cholera cases among these classes occurring during the months of the south-west monsoon. Among the jails, the severer outbreaks of cholera occurred in those at Dhulia and Yarawda. Regarding the outbreak in the Dhulia jail in August, the medical officer observes—

"Cholera has prevailed in the town of Dhulia and surrounding districts. Ten cases occurred in the jail. Four of these had just been admitted in the prison, and probably brought the seeds of the disease with them. No connection could be traced between the attack of the remainder and the disease outside the jail." In September two cases of cholera occurred, and the medical officer reports—"I am happy to say the disease has now entirely disappeared in the town, and almost so in the surrounding districts."

Concerning the outbreak in the Yarawda jail, the medical officer observes—"One case has been treated as cholera. The only source to which the affection could be traced was exposure to damp and cold. The man had no opportunity of drinking water other than that from the Kurruckwasla tank, which supplies all Poona. It was drawn from a stand-pipe within the jail." The cause assigned for the increase in the number of cases of ague by the medical officer is—"About the hour of sunrise the mornings have been very cold, whereas the days have been hot, and it is probably to the sudden change of temperature that we should attribute the increase in cases of ague treated." Cholera prevailed more or less in the neighbourhood of the jail in August. The medical officer writes—

"We have had 13 cases, with 7 deaths, in the jail. The last admission took place on the 19th August. The disease fortunately did not spread through the jail, though the cases came from different sleeping-barracks, and the men had been employed on different works. It was found impossible to ascertain the origin of the disease. None of the

men engaged in attending on the cholera cases contracted the disease. One sweeper fell ill, but I satisfied myself that he had been employed in removing the excreta from the latrines inside the jail to the trenches prepared to receive them, and had never been engaged in any way in connection with the cholera patients, whether before or after they were taken ill."

The rainfall in 1877, as in the year before, was very deficient and much below the average. It was "particularly marked by the unseasonable distribution of the rainfall." The temperature of the air appears to have been decidedly above average at most of the stations for the greater part of the year, particularly during the monsoon months, June to September.

"In October there was a sudden fall in temperature in all the stations, except at Karachi." At Disa the temperature was "very exceptionally high" in August, "when the thermometer stood, on the average of the month, more than seven degrees higher than usual."

Regarding humidity of the air it is recorded—

"The abnormal curves of vapour pressure . . . are, like those of the previous year, very different in form at the northern and southern stations; but there is much of the same significant *opposition* of character about them as appeared in 1876. For instance, while the hot-weather months March and April were unusually *damp* at the two northern stations, they were unusually *dry* at the two southern stations; and, again, in October, while the curves for Karachi and Disa both exhibit low values of vapour pressure, those for Poona and Belgaum show high values of this element. The above conditions are almost exactly the reverse of those which obtained in the hot months and in October of the previous year. These facts may be generalised by the statement that in 1876 and 1877 unusually dry weather before the summer monsoon was followed by unusually damp weather after it, or *vice versâ*. It would, of course, be unsafe to accept this generalisation as a guide for the future, founded as it is on the evidence afforded by the observations of two years only. At present it must be regarded as requiring further confirmation."

The abnormal variations of the wind-frequency in 1877 were, on the whole, very similar to those of the previous year, and even more decided in character.

"Thus at Karachi there was a great excess of south winds, especially during the summer, whilst at Belgaum there was a great excess of north winds in the summer half-year, and of south winds in the winter half-year. The wind-frequency in 1877, in respect to its abnormality, agreed, as in the previous year, with the abnormality of the rainfall. In Belgaum west winds were much more frequent in February than usual. In October, from the 5th to the 7th, a very decided cyclone passed at some distance from Bombay, along the Gulf of Cambay through Guzerat, and broke up in Central India."

Regarding the rainfall of 1877 it is recorded—

"From November to May the rainfall throughout the province was, as usual, insignificant. In Sind, Guzerat, the Konkan, and along the Sahyadri range the rainfall throughout the monsoon months, June to September, was deficient, particularly in July, which is usually the wettest month. In Guzerat and Sind there was practically no rain throughout the whole of the month of August. In the Deccan an excess of rain fell in June; but the fall in July and August was generally below average, especially in July. In September and October, however, more than twice the usual quantity fell in the southern collectorate, and about an average supply in the northern division. October was also unusually wet in Guzerat, the Konkan, and the Sahyadri range, a fact which is traceable to the influence of the cyclone already mentioned. . . . The summer monsoon current was not only *weaker* than usual, but it was, on the whole, also *less humid*." (From Mr. F. Chambers's "Brief Sketch of the Meteorology of the Bombay Presidency in 1877.")

Food in 1877, although somewhat cheaper than in the preceding year for the whole province, was at high famine rates in many of the districts, as will be seen from the annexed statement showing the average ordinary prices

of the staple food in each district—Sind districts excluded—as compared with the prices prevailing in the first fortnight of January, April, August, and December.

STATEMENT *showing the Average Ordinary Prices of the Staple Food in each District of the Bombay Province—Sind excluded—as compared with the Prices prevailing in the first Fortnight of January, April, August, and December* 1877.

Divisions.	Districts.	Ordinary Prices in lbs. per Rupee.		Prices in lbs. per Rupee for the fortnight ending							
				15th January.		15th April.		15th August.		15th December.	
		Joari.	Bajri.	Joari.	Bajri.	Joari.	Bajri.	Joari.	Bajri.	Joari.	Bajri.
Deccan.	Khandesh . .	56	54	31	29½	32½	28½	18½	18½	27¾	23¼
	Násik . . .	54	47	30¾	25¼	30¾	25¼	15½	15½	30¼	20¾
	Ahmednagar .	76	66	27½	26¼	23½	23¼	13½	13½	23½	24¼
	Poona . . .	65	51	21¾	23	21¾	20¾	12½	12½	21¾	18¼
	Satara . . .	39	35	21¼	20¾	18½	18¾	12¾	12¾	24	25¾
	Sholapur . .	66	60	19	22	17¼	20¼	12	12	17¼	25¾
	Belgaum . .	43	54	21	21¼	18½	20	12¾	9½	24	29
	Dharwar . .	50	43	18½	19½	17¼	19	10½	10½	32¼	33
	Kaladgi . . .	56	76	15¼	?	12¼	?	?	?	20½	28¼
Konkan.	North Kanara.	35	32	24	20	22	?	?	?	28	?
	Ratnagiri . .	38	38	22½	23¼	21⅓	22	11½	11½	20	11½
	Kolaba . . .	42	37	?	?	?	?	?	?	?	?
	Bombay City .	40	31	27½	25½	27½	26	19¾	19¾	18¾	19¼
	Thana . . .	41	40	27	21¼	21¾	21	15¼	15⅓	15¼	16⅓
Guzerat.	Surat . . .	40	36	22¾	23¾	24¼	24½	17½	17¼	22¾	18½
	Broach . . .	40	36	22¾	26½	26¼	26¼	16	16	22¾	17¾
	Kaira . . .	51	43	33½	27¾	26⅓	26½	13¼	14½	20	17¾
	Panch Mahals.	53	47	45	32	34½	29	21¼	21¼	17¾	14½
	Ahmedabad .	47	43	36	28	30	25½	18	18	22	20

The remarks made with reference to the corresponding statement for the preceding year apply, *mutatis mutandis*, to the above statement also. The influence of the high prices prevailing in the Guzerat districts during the last half of the year will be seen in the results of cholera prevalence during the following year.

1878.—In this year cholera prevailed with a fresh epidemic activity in several portions of the province; but, on the whole, the general death-rate from the disease was less than that of the preceding year. Compared with the course of the disease in the preceding year, the returns for 1878 show a marked persistence of cholera in epidemic form in all parts of the province except the Sind division.

At the close of 1877 cholera showed a decided tendency to subsidence in all the districts affected by the disease, excepting Belgaum and Poona in the Deccan, and Bombay and Thana in the Konkan. In the Guzerat districts the epidemic of 1877 was subsiding at the close of that year in Broach and Surat; but in Kaira, Panch Mahals, and Ahmedabad the disease, having reappeared only in October and November, was still in epidemic prevalence at the end of that year.

In 1878 the prevalence of cholera in the beginning of the year was most conspicuous in those districts in which it showed a persistent activity at the close of the preceding year. Thus, Konkan, Bombay, and Thana show the disease in continuous activity from the year before, and Ratnagiri and North Kanara also, though in a less degree. In North Kanara cholera manifested a marked tendency to die out altogether, and disappeared entirely in November; whilst in Kolaba the disease, reappearing in May after an

absence of three months, prevailed only during the south-west monsoon season, and disappeared altogether in November.

In the Deccan the epidemic of the preceding year was continued into this year only in the districts of Belgaum and Poona, the disease appearing afresh in the Kaladgi district after an absence of two months; but it was revived sooner or later in all the districts of this division. Thus in Dharwar cholera reappeared in March, after an absence of three months; in Sholapur, Satara, and Ahmednagar in April, also after an absence of three months; in Khandesh in May, after an absence of five months; and in Násik not until July, after an absence of six months. In Belgaum and Dharwar the maximum intensity of cholera was in April and May; in Kaladgi in May and June; in Sholapur, Satara, and Poona in May, June, and July; in Ahmednagar in June, July, and August; in Khandesh in July, August, and September; and in Násik in August and September. In all the Deccan districts except Khandesh, in which the disease continued active at the end of the year, cholera rapidly subsided after a course of from five to seven months' prevalence, and completely disappeared in Kaladgi three, and Sholapur four, months before the close of the year.

In the Guzerat districts the cholera brought over from the preceding year acquired increased force in March, and prevailed epidemically until August, when the disease suddenly subsided, and at the end of the year had disappeared from all the districts of this division. In Surat the epidemic of 1877 was more prolonged and steadily persistent through 1878 than in the other districts; it finally ceased in November. In Broach the disease pursued a course somewhat similar to that observed in Surat. In Kaira the epidemic of 1877 acquired fresh force in March 1878, and, after four months of epidemic intensity, suddenly subsided in July. In Panch Mahâls the disease pursued a similar course, and finally ceased in September. In Ahmedabad, after a like course, the disease finally disappeared in October.

As in the preceding year, so in 1878 the Sind districts, excepting only a small outbreak in Thar and Pakar during March–April, preserved a complete immunity from cholera. The tendency of cholera in 1878, as in the preceding year, was towards subsidence, in continuation of the abatement commenced in the year 1876, although some renewal of activity was due in this year as the first of another triennial cycle, in conformity with the course followed in the three preceding triennial periods from 1866 to 1874 inclusive. But the renewal of the disease in epidemic form and the amount of its activity in 1878, as in the preceding year, was largely influenced as to locality and aggravation by the effects of the famine. At the end of 1878 there was no sign of the presence of cholera in any of the districts of the Bombay Province excepting Bombay city, Thana, and Khandesh. The year 1878 began with 735 cholera deaths in January, and ended with 88 in December; the corresponding numbers for the preceding year are 3734 and 797 respectively.

In the Bombay Provincial Sanitary Report for 1878, by Dr. J. Lumsdaine, a tabular statement is furnished, as here reproduced, in which are shown the deaths registered from cholera during the previous twelve years from 1866 to 1877 inclusive, and the ratios per 1000 of population and of all deaths, together with the means for the twelve years compared with the results for 1878.

Years.	Cholera Deaths.	Ratio per 1000 of Population.	Ratio per 1000 of all Deaths.
1866	23,027	1·85	124
1867	5,143	0·32	32
1868	6,347	0·50	35
1869	52,380	3·77	184
1870	2,666	0·20	12
1871	5,821	0·41	21
1872	15,642	0·03	44
1873	283	0·02	1
1874	37	0·01	0
1875	47,555	2·93	196
1876	32,117	1·98	87
1877	57,252	3·54	91
Means	20,689	1·38	63
1878	46,743	2·89	88

With reference to this statement Dr. Lumsdaine observes—

"Now in this table there is evidence, if not proof, that for the time specified there was a recurrence of similar conditions at regular periods. Three successive times a cholera wave surged, and retired with rhythmic precision. Commencing from 1865, the cycles of intensity were in 1869, 1872, and 1875, and had not the balance been disturbed, there might have been again the usual two years of comparative immunity. But in 1876 the famine-cloud was gathering, and in 1877 it broke with appalling fierceness. In the first year there were grave indications of growing distress, and in the second there was dire and positive want. With the ghoul of cholera there was now the spectre of famine, and where the hand of the one was stayed, that of the other went out and brought in its victim. For 1875 the deaths from cholera were 47,555, and for the two years, which ought to have been years of exemption, the totals are respectively 32,117 and 57,252. For 1878 they fall to 46,743, but this is more than double the mean of the entire period. Making every allowance for the inevitable confusion between deaths from cholera and those from famine, diarrhœa, and other effects of the calamity, the record shows only too plainly how crushing was the blow, and how completely the normal conditions were disturbed."

In the subjoined tabular statement, taken from the same report, are shown the number of attacks and deaths, the total of deaths from all causes, and the ratio per 1000 of cholera deaths to attacks, to total population, and to total deaths, in each month of the year 1878.

Months.	Number of Attacks by Cholera.	Number of Deaths by Cholera.	Total Deaths from all Causes.	Ratio per 1000 of Cholera Deaths to		
				Attacks.	Total Population.	Total Deaths.
January	1,073	735	41,763	685·3	0·04	17·6
February	933	616	31,828	660·2	0·04	19·4
March	2,685	1,586	34,060	590·7	0·10	46·6
April	10,354	6,415	39,674	619·5	0·39	161·7
May	15,587	9,964	45,567	639·2	0·62	218·7
June	19,093	10,950	45,753	573·3	0·67	239·3
July	14,128	7,891	49,412	558·5	0·49	159·7
August	10,987	5,928	56,911	539·9	0·37	104·2
September . . .	3,598	1,882	52,364	523·1	0·12	36·0
October	652	434	48,263	665·7	0·03	9·0
November . . .	341	254	46,706	744·9	0·02	5·4
December	124	88	40,650	709·7	...	2·2
Totals . . .	79,555	46,743	532,951	587·6	2·89	87·7

The attacks and deaths in the several quarters were distributed thus:—

	Attacks.	Deaths.
First quarter . . .	4,691 . . .	2,937
Second „ . . .	45,034 . . .	27,329
Third „ . . .	28,713 . . .	15,701
Fourth „ . . .	1,117 . . .	776

Out of 284 registration circles, 207 were affected by cholera in 1878 against 206 in the preceding year. The distribution of the registration circles affected is shown in the annexed tabular statement, which includes all the registration circles and villages in the province.

STATEMENT *showing the Distribution of Cholera for each District in* 1878.

Districts.	Registering Circles.	Number of		Number of Towns and Villages		Date of		Total Deaths.
		Towns.	Villages.	Affected.	Not Affected.	First Death.	Last Death.	
Khandesh . . .	26	4	2,625	512	2,117	May 23	Dec. 31	6,077
Násik	16	4	1,629	92	1,541	July 21	Nov. 27	871
Ahmednagar . .	14	3	1,342	175	1,170	April 22	Oct. 29	2,267
Poona	11	3	1,184	223	964	Feb. 16	Oct. 20	3,601
Satara	15	3	1,352	398	957	April 17	Oct. 15	5,386
Sholapur	10	3	716	222	497	April 15	Aug. 31	3,074
Belgaum	11	4	1,085	322	767	Feb. 7	Sept. 28	5,757
Dharwar	18	4	1,413	117	1,300	March 6	Sept. 28	1,790
Kaladgi	10	2	1,201	176	1,027	March 25	Aug. 31	2,230
North Kanara . .	13	2	972	14	960	Jan. 1	Oct. 15	74
Ratnagiri . . .	10	2	1,249	54	1,197	Jan. 1	Nov. 18	559
Kolaba	8	2	965	39	928	May 29	Oct. 12	787
Bombay City . .	1	1	1	1	...	Jan. 1	Dec. 31	1,165
Thana	14	3	2,119	139	1,983	Feb. 10	Dec. 18	1,809
Surat	10	2	778	167	613	Feb. 2	Nov. 30	1,726
Broach	8	2	405	114	293	Feb. 22	Oct. 13	1,027
Kaira	11	4	585	202	387	March 12	Sept. 25	1,594
Panch Máhals . .	7	2	663	347	318	Feb. 5	Sept. 14	4,130
Ahmedabad . . .	12	5	881	227	659	Jan. 1	Oct. 22	2,793
Karachi	14	1	3,328	...	3,329	...	...	...
Haidarabad . . .	14	1	5,967	...	5,968	...	...	...
Thar and Pakar .	8	1	1,585	3	1,583	March 24	April 22	26
Shikarpur . . .	20	3	4,638	...	4,641	...	...	...
Sind Frontier . .	4	1	1,015	...	1,016	...	...	...
Total . . .	285	62	37,697	3,544	34,215	Jan. 1.	Dec. 31	46,743

The statement shows that 160 out of 222 rural circles were affected, and 41 out of 55 towns. Of all the civil cantonments, 7 in number, Deolali alone escaped. Of the 24 districts, 20 were affected.

In the subjoined statement are shown the deaths by sexes, as given in the report referred to, in each of the affected districts, and the death-rates, as well for 1878 as for the quinquennial period from 1872.

STATEMENT *showing Cholera Deaths by Sexes in each of the Affected Districts, and the Death-rates as well, for* 1878 *and for the Quinquennial Period from* 1872.

Districts.	Cholera Deaths, 1878.			Ratio per 1000 of Population.			Mean Ratio per 1000 for previous five years.
	Males.	Females.	Total.	Males.	Females.	Total.	
Panch Mahâls . . .	2,295	1,835	4,130	18·17	16·03	17·15	1·26
Belgaum	3,057	2,700	5,757	6·38	5·87	6·13	3·38
Khandesh	2,999	3,078	6,077	5·65	6·18	5·91	1·54
Satara	2,987	2,399	5,386	5·54	4·60	5·08	2·31
Sholapur	1,776	1,298	3,074	4·80	3·72	4·28	1·95
Poona	1,986	1,615	3,601	4·25	3·66	3·97	1·98
Ahmedábad	1,533	1,260	2,793	3·49	3·22	3·37	0·99
Broach	545	482	1,027	2·98	2·87	2·93	1·07
Ahmednagar	1,153	1,114	2,267	2·91	2·93	2·93	2·26
Surat	874	852	1,726	2·87	2·81	2·84	1·00
Kaladgi	1,227	1,003	2,230	2·94	2·52	2·73	3·29
Kolaba	370	417	787	2·08	2·42	2·25	1·51
Thana	873	936	1,809	1·99	2·29	2·13	2·43
Kaira	956	638	1,594	2·28	1·75	2·04	0·92
Dharwar	965	825	1,790	1·97	1·71	1·81	3·62
Bombay City . . .	734	431	1,165	1·84	1·76	1·81	1·18
Násik	441	430	871	1·85	1·31	1·27	1·43
Ratnagiri	249	310	559	0·51	0·58	0·55	0·83
North Kanara . . .	45	29	74	0·22	0·15	0·19	1·88
Thar and Pakar . . .	11	15	26	0·11	0·19	0·14	...
Totals	25,076	21,667	46,743	2·96	2·82	2·89	1·66

For Khandesh, Ahmednagar, Kolaba, Thana, Násik, Ratnagiri, and Thar and Pakar the death-rate for females exceeds that for males, but in the other districts it is the other way.

The rainfall of 1878 was very copious, and greatly exceeded that of any other year of our series of twenty, and was nearly 20 inches above the average annual fall. As will be seen by reference to Table No. V., the fall in the third quarter alone exceeds the average annual fall by more than 5 inches. The distribution of this unusually abundant supply was fairly general, all parts of the province, Sind included, receiving a proportionate share. The prices of food, notwithstanding the plentiful rainfall, still continued at famine rates, the provincial average price of the staple food-grain for this year being more than twice as high as in the year before.

1879.—Cholera in this year, following the normal course, declined in prevalence in a very sudden and marked manner from the high epidemic intensity of the year before.

Comparing the returns for 1879 with those for 1878, we find that the subsidence of the cholera, which was so marked during the later months of the latter year, was steadily continued during the earlier months of the former in all parts of the province, and that the disease in 1879 had almost completely disappeared from the districts of the Deccan, in which it had raged with a succession of epidemic outbursts so continuously since it commenced activity there in 1875, although it still showed a lingering tendency by a revival during the monsoon season in the districts of Khandesh, Násik, and Ahmednagar. In the Konkan, where cholera still persisted at the close of 1878 in Bombay and Thana, the disease showed no tendency to revive in 1879, although it continued more or less prevalent in both districts to the close of the year, a break of three months' freedom from the disease, however, occurring in Thana from January to March inclusive. In Kolaba cholera

reappeared in October, after an absence of seven months, and was prevalent at the end of the year.

In Guzerat, where cholera had disappeared completely from all the districts by from two to four months before the close of the year 1878, except in Surat, where it lingered on until the end of November, there was no recurrence of the disease in any of the districts until April 1879, Ahmedabad only excepted, in which cholera reappeared in January. In all the districts, however, the disease again subsided, and disappeared completely by September or October; in Surat alone, as in the preceding year, lingering on until November.

In Sind, which had enjoyed a more or less complete exemption from cholera during the preceding years of its havoc in the other divisions of the province since 1875, the disease suddenly broke out in epidemic form in all the districts during the month of May, but had completely disappeared, after a longer or shorter course in different parts, before the end of the year. In Thar and Pakar cholera deaths were registered only during May and June, in Upper Sind Frontier and Haidarabad from May to July, in Karachi from May to September, but in Shikarpur the disease was prolonged into November. This appearance of cholera in Sind in 1879 is a noteworthy feature of the course and progress of the disease in the Bombay Province since the commencement of the epidemic at Násik in March 1875, and more particularly in relation to the great epidemic cholera of 1879 in the Punjab.

The first case of cholera reported in Sind in this year "was at Sakar, on the Indus, a town of 13,318 inhabitants. Here, between the 5th and 29th of May, there were 196 attacks and 115 deaths; but at that time the place was crowded to overflowing with troops and followers, Ordnance and Commissariat stores, transport animals, and that legion of the unwashed that gathers round an army about to take the field. Under the pressure of war the conditions were unavoidably such that at any time an outbreak might have been expected; indeed, the wonder is that, having occurred, it was not more severe." Cholera appeared at Karachi on the 9th May, at Haidarabad on the 18th, in the Thar and Pakar district on the 22d, and in the Upper Sind Frontier, north of Shikarpur, not until the 24th, although the disease had spread to Shikarpur soon after its appearance at Sakar.

At the end of 1879 there was no sign of the presence of cholera in any other districts of the Bombay Province than in Poona in the Deccan, and Bombay, Kolaba, and Thana in the Konkan. In Poona there were 94 cholera deaths in December, marking a fresh outburst of the disease, which had been almost entirely absent from the district since November 1878. The year 1879 began with 78 cholera deaths in January, and ended with 173 in December; the corresponding numbers for the preceding year were 735 and 88 respectively. In 1879, out of the 223 rural and 55 town circles, 92 and 24 respectively were affected by cholera. There was no cholera in the civil cantonments; the disease was recorded in 893 out of the 37,697 villages in the province; and of that number 679 were in the Sind division, the districts of which together contributed 4140 of the total 6937 cholera deaths registered in the year.

The rainfall in 1879, though greatly less than that of the preceding year, was still a little above the average. The fall in the second quarter was much above that in the corresponding period of the year before, whilst that of the third was greatly below its corresponding quarter respectively. There was a slight improvement in the prices of food, but they still ruled at famine rates for the province as a whole.

1880.—Cholera, having resumed its normal cyclic course in the preceding year, continued to subside steadily in this year. The returns show a continued subsidence of cholera in all parts of the province, and its entire absence from most of the districts during the greater part of the year. At the same time, the figures show a tendency to a revival of the disease at the end of the year in the Kolaba district in the Konkan, and in the Deccan districts of Poona, Satara, Sholapur, and Kaladgi. In 1880 there was no trace in Sind of the preceding year's epidemic, whilst in the Guzerat division there were but the very faintest signs of cholera, the year yielding only 4 deaths in Surat, 4 in Panch Mahâls, and a single death in Ahmedabad.

At the close of 1879 the only districts in the whole province which showed the presence of cholera were Bombay city, Kolaba, and Thana in the Konkan, and Poona in the Deccan. The outbreak of cholera in Kolaba in October 1879 ceased at the end of that year, and there was no sign of the presence of the disease here throughout 1880 until December, when cholera reappeared with 27 deaths in that month. In Bombay the disease passed on from 1879 into 1880, but at the lowest prevalence, only one or two deaths occurring in each month after March, and the total of the year being no more than 30. In Thana the epidemic of 1879 continued active in the early months of 1880, and finally subsided in April. In the Deccan, Poona was the only district which showed the presence of cholera at the end of 1879. In December of that year there was a sudden outbreak, with 94 deaths, in this district; in January 1880 the number rose to 388; and then, suddenly abating, the disease disappeared entirely in May. In November, however, cholera reappeared here with a single death in that month, and the number rose to 34 in December. Of the other Deccan districts, the only ones which showed signs of the reappearance of cholera in 1880 were—Nâsik, where an outbreak occurred, with 44 deaths, all in the month of February, and then no sign of the disease till August, in which month 4 deaths occurred, and 7 more in September, and no more during the rest of the year; Ahmednagar, where there were 2 deaths in September and 9 in December; and Sholapur and Kaladgi, in each of which, after a prolonged absence, cholera reappeared in December.

At the end of 1880, out of 24 districts, 7 showed the presence of cholera, viz., Bombay city, and the Deccan districts of Poona, Satara, Ahmednagar, Sholapur, and Kaladgi. The year 1880 began with 418 cholera deaths in January, and ended with 92 in December; the corresponding figures for the year before are 78 and 173 respectively.

The rainfall in 1880 was less, again, than that of the preceding year, and it was also below the average. There was a great improvement in the prices of food, however, and rates became comparatively cheap, as compared with the rates ruling during the two preceding years.

1881.—Cholera in this year, the first of the next triennial cycle, commenced a fresh epidemic course, and there was a very marked rise in the death-rate of the year. There was a marked general revival of the disease throughout the province, excepting the Sind division, which, as in the preceding year, remained completely free. In the rest of the province the diffusion of the disease was very generally distributed over its area, although in each of the divisions affected some one district almost or altogether wholly escaped the disease. Thus in Guzerat the Panch Mahâls district recorded no cholera throughout the year; in the Konkan, North Kanara registered only 2 deaths, one in April, the other in July; in the Deccan, Dharwar recorded only 5 deaths altogether, 2 in January and 3 in September. In

the area affected the Deccan districts show the disease in the strongest epidemic force, and next those of the Konkan. In Surat, however, the disease partook of the activity prevailing in the neighbouring Deccan districts; but in the other Guzerat districts it was nowhere more than ordinarily prevalent.

At the close of 1880 cholera was present in 12 out of the 24 districts of the province, but only in 5 of them did the disease show any signs of reviving activity, and in only 2 of them—Poona and Kolaba—was this revived activity continued on into 1881. Thus the year 1881 opened with cholera active during January in only the 2 districts of Poona and Kolaba, and with no trace of the presence of the disease in any other part of the province, excepting a solitary death in the town of Surat, and two more in a village of the Dharwar district on the 4th January. In February it was the same; excepting a single death on the 5th of the month in a village of the Ratnagiri district, the cholera of the month was wholly confined to the two previously affected districts. In March the cholera of the year began to show signs of its approaching activity; for, whilst it had ceased in Poona and was declining in Kolaba, it made its appearance in the towns of Bhosawal in Kandesh, in Bombay city, Surat, and Ahmedabad, and in the following month in Thana and Ratnagiri, and, with a solitary death in each, also in Kaira and North Kanara.

In May epidemic prevalence was established in Khandesh, Bombay city, Thana, Surat, and Broach, and in each of these the disease then ran a steady and more or less severe epidemic course. From the continuous area covered by these five districts the disease steadily advanced southwards, and during the next two months broke out in all the districts in that direction, excepting Dharwar and North Kanara in the extreme south, both of which remained practically exempt throughout the year.

In June cholera recommenced activity in Kolaba and Ratnagiri, and in July in all the other Deccan districts except Belgaum, in which also, however, it made its appearance in the following month. Thus by the month of August cholera had covered the whole area of the province situated southward of the area in which it first started into activity in March. To the northward of this latter area cholera made little progress. Although the disease broke out in considerable force in Surat, and in much milder force in Broach, in May, it did not appear in Ahmedabad until July, and in Kaira until August. In these last districts the disease ran a very mild epidemic course of only three months, whereas in the other two districts affected—Panch Mahâls, in the north, remaining entirely exempt—its epidemic career was extended over six months. The disease finally ceased in all parts of this division during October.

From the above-described distribution of the disease, both as to season and region, it will be seen that the cholera of the year in this province was an essentially monsoon cholera, being coincident in its epidemic activity with the advent of the south-west monsoon rains, and in its distribution with the country swept by the monsoon current. The chief force of the epidemic was expended in the Deccan districts and Surat, the disease being less intense in the Konkan districts, and least prevalent in those of Guzerat, Surat alone excepted. In October the epidemic ceased entirely in Guzerat, and was generally on the decline in the other affected districts. During the following month the disease ceased in some of these also, but in Poona and Satara it was still prevalent in December, although evidently on the decline; whilst in Kaladgi, Kolaba, and Bombay city it broke out afresh in that

month with some considerable activity, indicative of renewed epidemic prevalence in the early months of the next year.

The cholera of 1881 in this province commenced with 79 deaths in January, and ended with 266 in December. The spring minimum of prevalence fell in the months of March and April, the maximum intensity of the disease was attained in August, and the autumn subsidence commenced in September by a sudden fall in the mortality to about half that of the preceding month. During the succeeding months the general subsidence of the disease continued progressively to the close of the year, and would have been more conspicuous in December but for the revival above mentioned, the three districts thus affected yielding together 185 out of the total 266 deaths registered in that month.

Distributing the mortality of the year by the climatic seasons into which it may be naturally divided, we have a total of 415 cholera deaths in the cold season of 121 days—December to March inclusive—or at the rate of 3.4 per day; a total of 364 deaths in the hot and dry season of 61 days—April and May—or at the rate of 6 per day; a total of 14,012 deaths in the rainy season of 121 days—June to September inclusive—or at the rate of 115 per day; and a total of 1903 deaths in the hot and damp season of 61 days—October and November—or at the rate of 31 per day. In the year 1881 there were recorded 34,883 attacks and 16,694 deaths from cholera; the mean percentage of deaths to attacks of the twelve months was 47.36, but the proportion varied greatly at the different seasons. For instance, in January, February, and April the percentage ranged between 71.43 and 78.33; in March, May, November, and December, between 52.27 and 59.53; and in the other months, between 46.54 and 49.18.

The following particulars are recorded regarding the first appearance of cholera in the different districts:—

Khandesh.—Cholera appeared on the 8th March in the town of Bhosawal, on the main railway line to Calcutta, and 24 cases and 11 deaths were reported up to the 31st. The disease then disappeared for more than a month, but reappeared in the same town on the 6th May, and during that month 17 attacks and 7 deaths were registered. Another lull occurred, and then the disease again appeared in this town on the 19th June. Up to this time the town of Bhosawal was the only place reporting cholera in this district, but a week later the disease appeared in a neighbouring village in the same circle, and after that spread southwards over the district until August. In September the disease commenced to abate, and at the close of the year was present only in a single village in the district. Altogether 7389 attacks and 3176 deaths from cholera were reported, and they were distributed in 3 out of 4 towns and 328 out of 2679 villages. The deaths were at the rate of 2.57 per mille of the population of the district, and of 43.00 per cent. of the attacks.

Násik.—The first case of cholera was reported on the 31st July from the town of Maligam. On that day there were 14 attacks and 3 deaths. In August the disease spread rapidly over the district, and continued rife until the end of October; after which it suddenly abated in the district generally, and finally ceased by the end of November. Altogether 11 out of 12 circles were affected, 1 out of 2 towns, 1 out of 2 cantonments, and 147 out of 1629 villages. The number of attacks was 3275, and deaths 1461; the death-rate 1.87, and the percentage of deaths to attacks 44.61.

Ahmednagar.—Cholera first appeared on the 7th July in the town of Ahmednagar, and on the same day in the village of Bhingar, two miles from the city. "Before this outbreak a strange phenomenon was noted in the

city of Ahmednagar. No less than 735 cats died in the city between the 1st and 20th July." A similar occurrence, it may be here noted, was observed in the city of Delhi, in the Punjab Province, at the time of an outbreak of cholera there in 1875 (see History of Cholera in the Punjab Province for that year). In August the disease was prevalent in every circle, and, although on the decline, continued rife all through September. During October it abated rapidly, and finally ceased by the end of November. Out of 1331 villages, 267 recorded cholera. The total attacks were 5709, and deaths 2645; the death-rate 3.52, and the percentage of deaths to attacks 46.33.

Poona.—In this district cholera continued over from the preceding year in the city of Poona and in a village of the Purundhar circle, and during January appeared in two villages of the Haveli circle and one of the Maval circle; but by the 15th February it had entirely disappeared, and no cholera was reported in the district until July, when the disease reappeared in the city of Poona, in two villages of the Haveli circle, and two of the Bhimthadi circle. "The greatest number of cases occurred on the dates on which pilgrims returned from Alandi and Pandharpur. It was neither confined to any particular quarter of the city nor to any particular class of people, but the better and more cleanly classes escaped." Out of 1181 villages, 180 recorded cholera; the attacks were 2890, and deaths 1412; the death-rate 1.57, and the percentage of deaths to attacks 48.85.

Sholapur.—Cholera first appeared on the 3d July in Bhambawadi, a small village of 656 inhabitants in the Mádha circle, and soon spread to 5 other villages in the same circle, to 1 in Karmala, 1 in Sholapur, and 2 in Pandharpur circles, besides the towns of Barsi and Pandharpur. Out of 709 villages, 100 reported the disease. Attacks, 2793; deaths, 1307; death-rate, 2.24; percentage of deaths to attacks, 46.79.

Satara.—The first case of cholera was reported from the village of Shirgaon, in the Wai circle, on the 28th July, and up to the 31st there were 3 attacks with 1 death. From this point the disease spread southwards, and during the month of August affected 22 villages distributed over 7 circles. During September the disease continued in all the affected circles, and appeared afresh in 5 villages of the Satara and 2 of the Patan circles. "The disease in this month was attributed to the scanty rainfall." During October the disease continued in the previously affected circles, and appeared in one village of the Jaoli circle and in the town of Karad. In November the disease abated everywhere, and finally ceased on the 26th December, on which date the last case of the year was reported. Out of 1340 villages, 128 reported the disease. Altogether, the attacks were 2057, and deaths 866; death-rate, 0.82, and percentage of deaths to attacks, 42.11.

Belgaum.—Cholera first appeared on the 19th August in the village of Shebdal, in the Athni circle, and a week later appeared in 3 other surrounding villages, the deaths for the month being 60, and the attacks 175. In September the disease was present in 7 villages, and appeared in the town of Athni and in 1 village of the Chikodi circle. In October cholera disappeared from the town of Athni, but continued in the circles previously affected. In November it reappeared in the town of Athni, and lingered on there after its disappearance in the rural circles, and finally ceased in December. Out of 1073 villages, 20 recorded cholera. Total attacks, 840, and deaths, 349; death-rate, 0.40, and percentage of deaths to attacks, 41.55.

Dharwar.—In this district only 5 deaths were reported from cholera during the year, viz., 2 from Andalki village, in Bankapur circle, on 4th and 5th January, and 3 from Galagi village, in Kalghatgi circle, on the 26th September. There were 4 attacks in each village.

Kaladgi.—Cholera first appeared on the 11th July in the Agasnal village, Indi circle, and 11 days later in 2 villages of the Bijapur circle. During the following months 11 other villages were affected, the last being a village in the Bijapur circle in December. Out of 1139 villages in the district, 14 reported cholera. Total attacks 334, and deaths 138; death-rate, 0.22 per mille of population, and percentage of deaths to attacks, 41.02.

North Kanara.—Only 2 cholera deaths were recorded in this district during the year, the first on the 17th April, in a village in the Sirsi circle, the other on the 25th July, in another village in the same circle, where 3 seizures occurred.

Ratnagiri.—Cholera first appeared on the 5th February in the Deogad village, and stayed until the 9th, during which time there were 2 attacks and 1 death. The next cases reported—5, all fatal—occurred on the 17th April in a village in Malvan circle. Then no cholera was reported until the 14th June, when the disease appeared in a village of the Dapoli circle. During July cholera appeared in the town of Ratnagiri, where the first case occurred on the night of the 12th, and by the 18th it had spread to 11 villages in the Ratnagiri circle, 6 in Dapoli circle, and 1 in Sangameshwar circle. In August it appeared in the Chiplun circle. The last case in the district was reported on the 23d October in Dapoli circle. Out of 1295 villages, 51 reported cholera. Total attacks, 865, and deaths, 484; death-rate, 0.49; percentage of deaths to attacks, 55.95.

Kolaba.—The cholera of the preceding year was present in January in 2 villages in Pen circle; but in February it disappeared from these, and appeared in another village in the same circle, and continued there during March. In April and May no cholera was reported, but in June the disease appeared afresh in one village in Alibagh circle and one in Mangaon circle. In July it continued in these circles, and appeared also in the town of Alibagh and in Roha circle. The people in the affected localities were chiefly Kolees by caste; and it is stated, "Cholera broke out in the Kolees' quarter, where cleanliness was difficult to enforce, as there is a large population of these fishermen crowded into many small houses closely packed together near the creek, the bank and neighbourhood of which is used by them for obeying calls of nature. Fortunately they obtained their supply of drinking-water from good wells at some distance from their houses." In August the disease was in every circle of the district, "and its victims were principally the old and infirm or the weak and insufficiently nourished." The disease continued, with various fluctuations, to the end of December. Out of 973 villages, 73 were affected by cholera. Total attacks, 1090, and deaths, 687; death-rate, 1.80, and percentage of deaths to attacks, 63.03.

Bombay City.—There was no cholera death reported during the first two months of the year in the city of Bombay, but the disease was present in more or less activity during each of the other ten months. The course of the disease during this year is shown in the annexed tabular statement of the monthly cholera mortality during the several years subsequent to 1866, in continuation of the tabular statement given given on page 73.

STATEMENT *showing the Number of Deaths from Cholera registered in the Island of Bombay during each Month of the Fifteen Years* 1867 *to* 1881.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1867	20	21	10	29	6	12	6	6	6	8	4	...	128
1868	1	...	1	3	3	2	3	7	1	33	60	104	218
1869	137	118	107	83	91	45	53	57	62	25	9	2	789
1870	6	4	6	3	7	13	2	71	75	49	62	88	386
1871	77	44	38	28	17	10	5	11	15	34	9	6	294
1872	7	2	4	7	6	7	46	54	33	11	3	11	191
1873	22	13	17	12	8	7	3	1	2	3	2	2	92
1874	1	...	2	2	7	...	2	1	2	2	...	...	19
1875	1	1	...	31	67	132	279	168	43	53	38	21	834
1876	1	...	2	4	5	9	119	141	64	23	6	...	374
1877	1	61	111	185	337	704	495	337	162	42	21	54	2,510
1878	35	109	224	128	137	99	156	116	43	53	40	25	1,165
1879	27	10	13	4	29	14	33	74	64	41	10	4	323
1880	8	6	3	2	2	2	1	1	1	2	1	1	30
1881	...	...	2	9	68	85	111	73	48	33	9	91	529
Totals	344	389	540	530	790	1,141	1,314	1,118	621	412	274	409	7,882

Regarding the cholera of 1881 in Bombay city, the Sanitary Commissioner, Dr. Lumsdaine, writes—

"From March to December it was present more or less, though everything was done that could be done to check its spread. In every place in the native town where cholera broke out the most prompt and stringent measures were taken. During one quarter no fewer than 500 persons were removed from buildings in which cholera showed itself. Prompt measures were adopted wherever there was a presumption that a building or its drainage was defective. In other cases the tiles were taken off affected buildings and holes made in the walls, so as to let in light and air; earthen floors were dug up and sprinkled with carbolic acid, and the walls washed with carbolic acid and lime; disinfectants were freely used in the houses and in the vicinity, improvements were effected (wherever the disease was discovered), air spaces were formed, floors were raised, and free ventilation secured. Sulphur fires and sulphur fumigations were largely resorted to, as advocated by Deputy Surgeon-General Tuson at Calcutta. It would be too much to say that the good effects which followed were entirely due to these measures of precaution; but, without a doubt, they were very valuable aids, and they had special advantages. All classes had the greatest confidence in their efficacy; and where the occupants of infected houses were loth to leave them, the Health Department merely lit the fires, and the fumes speedily effected the desired clearance."

Yet, after all, the disease, as is shown by the monthly mortality registered, was not in the slightest degree checked by these measures. The cholera of the year commenced its career in March, and very steadily progressed as a mild epidemic to its climax, attained in July. It then gradually declined towards complete subsidence in November, in which months the deaths fell to 9, the level of the mortality in April. But in December the disease started into fresh activity, and suddenly attained a mortality higher than that of any other month in the year, excepting July—the month of climax of the previous epidemics, which, commencing in March, subsided in November. These facts show that the measures adopted, however great the confidence of the people in their efficacy, were not those at all calculated to check the mortality from cholera; and they show, further, that in order to check cholera mortality something more is necessary than the hurried adoption of such general or special measures of precaution. That something, all experience teaches, is a direct, timely, and judicious treatment of the person affected or prone to be affected by the disease.

Thana.—Cholera first appeared on the 29th April, on which date two fishermen, residing at Tembi in Mahim circle, were attacked on their way home from Agashi. They recovered, but their old mother took the disease and died. Her aged daughter, who lived at Phonda, and who had been to Tembi to see her sick mother and brothers, also took the disease and died at her house. Thus both Tembi and Phonda, which are the quarters where the fishermen live, and which lie to the south side of Mahim, became affected, and some further attacks and deaths occurred. The disease was confined to these quarters and to the fishermen class, except in one instance in Phonda, in which a Bhandara family was attacked. During May cholera continued in this place, and appeared also in eight villages of the Bassein circle. During June and July it continued in these circles, and in the latter month appeared afresh in three other circles. At this time the Sanitary Commissioner made the following very judicious suggestions to the District Collector for adoption on the occasion:—"The employment of Native doctors to travel from village to village with medicines; extraordinary measures to be taken to prevent the sale of under or over ripe fruit and stale fish; the holiday caste-dinners to be discouraged as much as possible; the medicines to be distributed by Patels, and the villagers to be warned to apply at once in case of diarrhœa," &c. In August the disease attained its climax, and thereafter commencing to abate, finally ceased on the 20th November. Altogether the attacks were 911, and deaths 531. Out of 2098 villages, 54 recorded the disease; death-rate, 0.58, and percentage of deaths to attacks, 58.29.

Surat.—An isolated case of cholera was reported in January, on the 23d, in the town of Surat, and proved fatal on the 26th. No other case of cholera was reported until the 11th March, on which date the disease appeared in Adajan, the only village affected in Chorasi circle, situated some 2½ miles from Surat city across the River Tapti, where two deaths were recorded. Again there was no report of cholera until May, when the disease reappeared in Chorasi circle and the town of Surat, and for the first time in Olpad circle. At the same time cholera appeared in the Surat cantonment, and the surgeon in charge of the Native troops there thus accounts for its origin:—"A Sepoy, Sindi, who bore a bad character in the regiment, broke through the guard on the evening of the 14th May, and spent the night in the city. On his return in the morning he was suddenly attacked with severe vomiting and purging, and died in four hours." In June cholera was in five circles, and attained its maximum of prevalence. The Deputy Sanitary Commissioner, who inspected the affected localities, in one of his reports states, "that infants enjoyed a peculiar immunity from the disease, whereas the greatest number of victims was of adult-age periods; the cholera mortality increased with age up to thirty years, and then declined with advanced age. By caste the greatest mortality was amongst the low-caste Hindus." During the next two months the disease continued more or less prevalent, but declined in September, and finally ceased by the end of October. Out of 780 villages, 149 recorded cholera; attacks, 5388, and deaths, 2751; death-rate, 4.48, and percentage of deaths to attacks, 51.06.

Broach.—Cholera first appeared on the 28th May in the village of Ankleswar, in the circle of the same name. During June it continued in this village and appeared in another in the same circle, and also in a village of the Hansot circle. During July, whilst continuing in the affected circles, the disease appeared afresh in two villages of the Broach circle. In August it ceased in the Broach circle, and by the end of the following month in the other circles also. Altogether, 11 villages out of 403 in the district reported

cholera; attacks, 169, and deaths, 120; death-rate, 0.37; and percentage of deaths to attacks, 71.01.

Kaira.—Cholera first appeared on the 8th April in the town of Nadia, where up to the 17th of the month there were 4 attacks, with 1 death. The next report of cholera was not until the 1st August, on which date it appeared in a village of the Anand circle, and during the month in another village in Mehmadabad circle. In September, whilst continuing in these circles, the disease appeared in one village of Matar circle, and in the towns of Kaira and Borsad. By the 17th October the disease had ceased in all the affected places. Altogether 3 out of 4 towns and 6 out of 577 villages recorded cholera; attacks, 149; deaths, 72; death-rate, 0.09; and percentage of deaths to attacks, 48.32.

Ahmedabad.—The first death from cholera was reported on 22d March from Goma village, in Sanand circle. By 6th April the disease appeared in another village of the same circle and in the town of Ahmedabad; there were altogether 4 attacks and 3 deaths reported in this month. In May no cholera was reported, but in June 2 cases, which both recovered, were reported from Sanand circle. "In July the disease continued in the town of Ahmedabad, where 43 fresh cases and 17 deaths took place. This cholera had existed in the city for about three months, but had never become epidemic, and had not necessitated any measures beyond those always adopted. The continuous cold, wet, unseasonable weather was probably a chief factor, inducing predisposition to bowel complaint." On the 16th July the disease broke out in the Ahmedabad jail. The following particulars of this outbreak and its treatment are from the report furnished by the medical officer, Dr. S. H. Banks:—On the 16th July the first case of cholera was admitted to hospital, and died twenty-one hours after admission. On the following day 4 cases more admitted; they all terminated fatally in periods varying from seven hours to six days after admission. On the 18th, again, 4 cases were admitted; these all recovered. On the 19th and 20th one case was admitted each day; they recovered. There was no other admission until the 5th August, when "another case of cholera occurred at night in the cells of the upper storey, and died in twenty-six hours after." This was the last case. "The weather since the first case has been very wet, close, and hot. All persons who were attacked had been for a considerable time in the jail, had no apparent communication from outside; and while cases occurred in all parts of the jail on the ground-floor, there was only one attacked in the cells on the upper storey." Regarding the treatment of these cases, it is recorded—

"Treatment on admission—first four cases—stimulants, opium, sulphuric ether, tincture of cantharides, Leith's mixture, were administered, death resulting in each case. The following treatment was then adopted:—On admission each patient got ten grains of quinine dissolved in fifteen drops of diluted sulphuric acid, to be repeated once in two hours after; unlimited boiled water, ice medicated with sulphuric acid, diluted, to allay thirst; shampooing; fires lit near their beds to keep them dry and warm. The diet consisted of sago, beef-tea, and ice to suck; stimulants during the stage of collapse, mixed with beef-tea. Under this treatment the other six cases recovered. During this outbreak several cases of diarrhœa were kept under close observation; all recovered save one, an old weak man, who died from exhaustion. Among the most useful of the prophylactic measures adopted were the following:—The stools were carefully disinfected before they were taken from the hospital. The food was placed under rigid surveillance as to the quality and the manner in which it was cooked. The drinking-water was boiled prior to its being used. Sulphur burnt in all the cells, and a dose of diluted sulphuric acid (half-drachm doses) with a drop and a half of carbolic acid, with boiled water, was given to each prisoner and the jail establishment morning and evening."

During August and September cholera was present also in the town and cantonment of Ahmedabad and in the town of Dholka. The last cases in these places occurred on the 30th September. Altogether 2 out of 4 towns, its one cantonment, and 2 only out of 857 villages in this district recorded cholera; attacks, 305; deaths, 159; death-rate, 0.19; percentage of attacks to deaths, 52.13.

Shikarpur.—A solitary case of cholera was reported from this district, on the 20th May, in the town of Sakar.

The main prevalence of the cholera of 1881 in this province was in a few of the districts situated in the lower part of the Narbada valley and the country to its south. Out of the 24,535 towns and villages in the 18 affected districts—Bombay city excluded—1546 recorded cholera, and they were distributed among 114 out of the 223 rural circles in the province. The percentage of affected villages to total villages is 6.25. Out of 55 town circles, 25 were affected with cholera during the year, but in only 6 of the number did the death-rate exceed 5 per mille of population.

The rainfall of 1881 was about equal in quantity to that of the year before, and was below the average; the fall in the third quarter was greater in this than in the preceding year, and in the second it was less respectively. Food in 1881 was very cheap—cheaper than in any previous year of the series dealt with in this history, except 1874, in which year the average price of the staple food-grain slightly surpassed in cheapness that of this year.

Summary Review.—The net results of cholera mortality, average rainfall, and average prices of the staple food-grain in the Bombay Province during the twenty years 1862 to 1881 are exhibited at one view in Table No. V.

For the first three years of the series our only guide to the general prevalence of cholera among the civil population of the province is that afforded by the mortality from the disease recorded in the island or city of Bombay. It is known, however, that in 1862 cholera was more or less widely prevalent in epidemic form throughout the province, the Sind division alone remaining exempt. The incidence of the disease among the European troops—for whom only, of the army, are the returns available in this year—was unusually severe, whilst among the jail populations it was altogether exceptionally so, the death-rates for the two classes being 4.43 and 17.03 per mille of strength respectively. The death-rate of the two classes together is 7.65, and this may be taken as an approximate index to that of the civil population in this year.

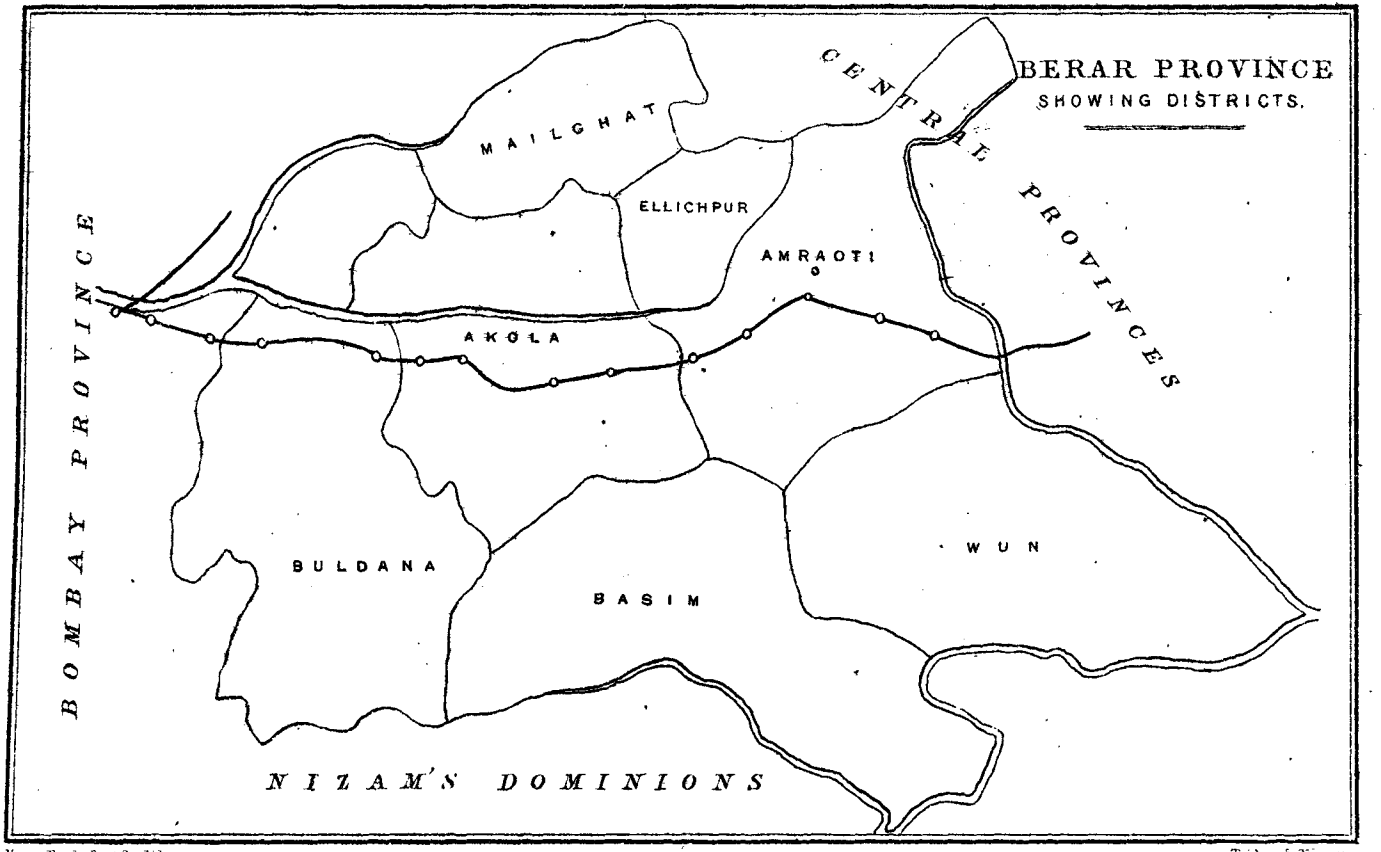
In 1863 there was a very marked and complete subsidence of cholera activity. The death-rate among the troops (Europeans only) fell to 0.83, and the jails returned no cholera mortality at all; whilst in Bombay city the cholera mortality of the year fell to 2309 deaths registered against 3164 in the year before, or to a death-rate of 2.88 against 3.95 respectively, assuming the population of the island to be 800,000. But the year 1863 was the first of the triennial cycle 1863–65, and in the normal course—as is very clearly illustrated by the deportment of the disease in this province in the succeeding triennial cycles—was due as a cholera of revived or maximum intensity in its cycle. Moreover, guided by the light of later experience—not only in this province, but in the other provinces of India also—it is very probable that, taking this province as a whole, the cholera of 1863 really was, in the normal sequence, a cholera of revived epidemic intensity in its cycle—due to prevail in this year at a maximum prevalence, at a medium or abat-

ing prevalence in the next, and at a minimum or subsiding prevalence in the third. That the course of the disease, however, was not in this regular order through the successive years of the cycle, as was due according to the teaching of all subsequent experience of the disease in this country, is a fact about which there is no question. Further, there is no question of the circumstances which were concurrent with this irregularity in the course of the cholera of this triennial cycle, whatever may be the opinions held regarding them in the relationship of cause and effect.

That the cholera of 1863 in this province was a cholera of maximum intensity in its cycle, or, at least, commenced as such, I will assume as a fact—basing the assumption upon the recorded recrudescent course of the disease during this year in the Bombay city—and that subsequent experience proved it not to have been so in the ultimate results of the cyclic course I will admit, and at the same time offer an explanation to account for the anomaly. The abnormal course of the cholera of this cycle during its two later years—1864 and 1865—was coincident with quite as distinctly marked abnormalities in the meteorology and food-supply of those years; the former being characterised mainly by unusually prolonged drought, and the latter by scarcity verging upon general famine, and, as a consequence thereof, coincident with abnormality in the life-conditions of the people, characterised by the effects mainly of widespread pressure and distress for food.

That this coincidence of the unusual prevalence or aggravation of epidemic cholera with unusual drought and distress for food, together with their effects—not always precisely contemporaneous—upon the condition of the people, during these two years in this province, is not a mere casual coincidence or exceptional accident, is proved by the recurrence of precisely parallel phenomena, not only in the observed course of the disease in other provinces of India, but also in this same province of Bombay—as in the triennial cycle 1875-78. Consequently the simplest explanation that suggests itself in conformity with the facts is, that they stand towards each other in the relation of cause and effect. By this it is not meant to assert that drought or famine of themselves alone can originate an epidemic of cholera. But it is meant to assert that an epidemic of cholera which is prevailing under other influences of weather may, and almost invariably does, become more or less intensely aggravated among a population which has been subjected to the effects which drought and famine, or the privations and distress consequent thereon, are known commonly to produce. And so it happened, in the case now under consideration, that the cholera of 1863 in this province, instead of being, in the normal course, the maximum cholera of the cycle 1863-65, was converted into the minimum by the operation of fortuitous conditions, which stimulated a normally abating and subsiding epidemic into revived activity, and progressively intensified its effects in proportion to the aggravating nature of the fortuitous conditions themselves. And that this was really the case is apparent from the fact of the immediate return of the disease to its normal course of cyclic periodicity upon the cessation of the abnormal conditions which had disturbed its regular career, and to its continuance in this normal course during three successive triennial cycles, until, in the fourth, a recurrence of the same abnormal conditions in the meteorology and food-supply—drought and famine—again interfered to mar the regularity; after which, once more, the disturbing conditions having terminated, cholera in the sixth cycle again resumed its normal triennial career of epidemic activity, abatement, and final subsidence in the successive years respectively.

A comparison of the column of food-prices with the column of death-rates for the civil population in Table No. V. will show at once the regularity with which they rise and fall together throughout the six triennial cycles included in the eighteen years 1863 to 1880 inclusive. The like relationship between the rainfall and the death-rate in the several years of the series is not so apparent. This may, perhaps, be explained by the consideration that under favourable conditions in respect to food-supply the population would be in a fitter state to cope successfully with the trials of weather influences. It will be observed, however, that there is a tendency to triennial periodicity in the rainfall similar to that which has been already adverted to in respect to the cholera prevalence, although it is not so clearly marked in all the cycles. A careful examination of the successive cyclic falls, however, seems to show that the epidemic revival of cholera in the first year of each triennial cycle is usually preceded by drought, more or less pronounced, in the preceding year or last of the preceding triennial cycle, as in the cycles 1869–71, 1872–74, and 1878–80. If we take the rainfall of the third quarter of the year alone for comparison with the cyclic revival of epidemic cholera, the defect of the rainfall of that period in the preceding year becomes still more apparent, the cycle 1875–77 then coming into its place with the cycles above indicated. Apart from these statistical data, general observation lends support to the opinion held by many, that epidemic cholera usually breaks out in the regions usually visited by it during seasons of abnormally high temperature, accompanied by unseasonable rain or atmospheric humidity, *in succession* to a period of drought more or less prolonged and more or less absolute. That is to say, a droughty winter and spring, followed by an unusually hot summer and copious rains, is favourable to the appearance of cholera in the epidemic form; the severity of its prevalence and its fatality depending upon the condition of the people in respect to food-supply, and habits in respect to exposure to weather influences, as will be illustrated in the succeeding pages in the cases of famine-stricken populations and pilgrim wanderings.



Vincent Brooks, Day & Son, Lith.

Trübner & Co., London.

SECTION IV.

BERAR PROVINCE.

Geographical Position.

THE Berar Province lies between 19° 26′ and 21° 46′ N. lat., and between 75° 58′ 45″ and 79° 11′ 13″ E. long., and is bounded on the north and east by the Central Provinces, on the south by the Nizam's dominions, and on the west by the Bombay Province. The divisions, districts, area, and population of the Berar Province, or, as it is officially styled, "The Haidarabad Assigned Districts," are shown in the annexed tabular statement.

STATEMENT *showing the Population, Area, and Density of Population in each District of the Berar Province for the Year* 1872.

Divisions.	Districts.	Population (Census 1872).			Area in square miles.	Population per square mile.
		Males.	Females.	Total.		
East Berar.	Amraoti	?	?	496,379	2,759	181
	Ellichpur	?	?	237,799	974	245
	Wún	176,059	167,367	343,426	3,907	82
	Total . .	?	?	1,077,604	7,640	139
West Berar.	Basim	135,108	125,797	260,905	2,958	94
	Akola	255,356	225,301	480,657	2,660	181
	Buldana	188,994	176,785	365,779	2,804	130
	Total .	579,458	527,883	1,107,341	8,422	133
	Total of province .	?	?	2,184,945	16,062	136

Physical Aspects.

Berar is, in the main, a broad valley running east and west, lying between the Satpura range on the north and the Ajanta range on the south. The valley at the base of the Satpura is locally called Berar Payanghat, and the tracts situated among the uplands and hills of the Ajanta range, Berar Balaghat. Berar is watered or drained, as the case may be, by the Purna, an affluent of the Tapti River, and a perfect network of streams descending into the main river from the hills on either side on the north and on the south. The soil of the valley is one vast superstratum of black loam overlying trap and basalt, and its area is now entirely cultivated, the whole surface being covered over at harvest-time by a sheet of crops. The rainfall of the province is regular and copious. The population is dense, and consists mostly of hardy and industrious agricultural tribes. The valley is traversed in its whole length from west to east by the railway from Bombay to Nagpur. It possesses one of the richest and most extensive cotton fields in India, and produces excellent crops of millet and oil-seeds.

The length of the province from east to west is about 150 miles, and its breadth averages 144 miles. The principal rivers are the Purna, the Tapti, the Wardha, and the Penganga or Peanhita. There is but one natural lake in the province, the salt lake of Lonar, a great curiosity. The forests of the province are composed chiefly of the Acacia Arabica; about 400 square miles of forest on the Gawilgarh Hills, and about 246 square miles of forest in South Berar, are conserved by the Government.

Climate.

The climate of Berar differs very little from that of the Deccan generally, except that in the Payanghat valley the hot weather is sometimes exceptionally severe. It sets in early, for the freshness of the short cold season disappears with the crops, when the ground has been laid bare by carrying the harvest; but the heat does not much increase until the end of March. From the 1st of May until the rains set in, about the middle of June, the sun is very powerful, though its effect is not intensified by the scorching winds of Upper India. The nights are comparatively cool throughout, probably because the direct rays of the sun have their influence counteracted by the retentiveness of moisture peculiar to the black soil, and by the evaporation which is always going on. During the rains the air is moist and cool. In the Balaghat country, above the Ajanta Hills, the temperature is much lower than in the plains. On the loftiest Gawilgarh Hills, the climate is always temperate; the Sanitarium of Chikalda is on this range, a few miles from Ellichpur (Hunter's *Imperial Gazetteer*).

The Gawilgarh Hills are locally called Mailghat, and are not included in the area under mortuary registration. They are on the northern boundary of the province. The Ajanta range interseets the whole of the province from east to west, and divides it into the Payanghat or "Lowland country" and the Balaghat or "Highland country." The Payanghat, or valley of Berar, lies between the Gawilgarh and Ajanta Hills, and extends the whole length of the province from east to west, in which last direction it is bounded by the Khandesh district of Bombay. The valley is from 40 to 50 miles in breadth, and varies in elevation from 800 to 1400 feet above the sea. After the crops are cut the valley is by no means inviting. "What with want of shade and verdure and the scarcity of water, one can scarcely imagine a more depressing country to march through." The chief rivers are the Purna and the Wardha; the former, with steep and soft banks and a bed of sand, or pebbles, or rocks, forms the great drainage channel of the Payanghat; the latter, with high banks and a stony bed, forms the eastern boundary of the valley.

The Balaghat has an elevation above the sea-level varying from about 900 to 2200 feet, and the general declination of the land is towards the south, in which direction the River Penganga forms the boundary of the province, and constitutes the chief drainage channel of the Balaghat. The general aspect of the country here is quite different from that of the Payanghat, and is more enlivening. Trees are more plentiful, and water is nearer the surface; the surface soil is, for the most part, trap, or trap with a light covering of black soil, and in the valleys rich alluvial. In the hot weather there is often a great scarcity of water (Berar Sanitary Report).

Cholera History, Statistical and Descriptive.

The statistics of cholera mortality in the Berar Province relate only to the civil population; the Tables Nos. III. and IV. of the series given with the other provinces are consequently omitted. The other tables here furnished are uniform in all particulars with the corresponding statements for the other provinces, with the exception that the cholera death-rates among the troops in Central India and Rajputana are—for want of another place—here incorporated in Table No. V., together with those for the civil population of Berar.

No. I.—STATEMENT *showing the Annual Total Deaths registered from Cholera among the Civil Population in each of the Districts of the Berar Province from the Year* 1868 *to* 1881 *inclusive.*

Districts.	Total Cholera Deaths registered among the Civil Population in the years													
	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Amraoti .	No information.	1,581	2	2	312	...	...	3,163	990	106	4,825	90	...	380
Ellichpur .		1,712	10	...	8	...	...	2,107	900	48	1,136	119	...	100
Wún . .		1,740	204	3	534	...	...	1,765	683	74	4,891	...	...	309
Basim . .		1,290	266	48	320	...	...	1,165	623	165	11,698	...	...	427
Akola . .		2,615	11	216	214	...	...	7,847	233	394	4,342	14	...	959
Buldana .		2,009	11	312	190	...	2	6,418	154	55	17,414	...	1	1,229
Total .	5,447	10,947	564	581	1,578	...	2	22,465	2,683	842	34,306	223	1	3,404

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Berar Province for the Fourteen Years from* 1868 *to* 1881.

Years.	Cholera Deaths registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	No information.															...	...
1863																...	...
1864																...	...
1865																...	34·14
1866																...	23·15
1867																...	36·71
1868	19	24	26	20	14	71	1,707	2,287	999	175	90	15	?	?	5,447	2·90	30·54
1869	...	219	...	1,759	1,385	770	3,047	2,618	848	164	18	19	?	?	10,947	5·20	34·33
1870	4	3	8	9	9	3	115	133	110	71	35	4	310	194	504	0·24	45·60
1871	2	1	...	2	...	45	175	71	135	106	28	16	354	227	581	0·26	20·64
1872	5	2	...	...	...	2	106	818	450	176	4	15	929	649	1,578	0·70	41·63
1873	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29·17
1874	...	...	...	2	...	...	...	...	...	...	...	...	1	1	2	...	32·86
1875	...	...	...	...	249	3,625	10,374	5,840	2,007	348	52	...	12,172	10,293	22,465	10·20	38·86
1876	...	...	...	...	19	109	142	469	662	720	410	152	1,467	1,216	2,683	1·20	26·87
1877	14	...	29	40	125	131	59	194	203	30	7	10	484	358	842	0·40	30·19
1878	2	1	...	83	2,320	6,731	9,444	11,263	3,692	627	85	58	17,679	16,627	34,306	15·60	44·63
1879	3	...	...	...	1	29	115	75	...	...	...	...	108	115	223	0·10	37·02
1880	...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	...	23·66
1881	...	...	...	...	...	1	245	1,744	1,064	217	50	83	1,760	1,644	3,404	1·60	37·51
Means	?	?	?	137	293	823	1,823	1,825	726	186	56	27	2,519	2,237	5,927	2·70	33·38

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the Berar Province in Inches and Cents for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	Rainfall in Inches and Cents in the Months of												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	No information.												?
1863													?
1864													?
1865	0·20	0·80	1·84	0·23	0·29	7·09	10·80	10·59	1·62	0·64	0·11	0·13	34·14
1866	0·00	0·00	0·01	0·02	0·23	4·02	8·44	7·92	1·24	0·53	0·00	0·74	23·15
1867	0·06	0·00	0·19	0·27	0·02	8·05	8·23	8·57	6·27	5·02	0·03	0·00	36·71
1868	2·53	0·03	1·21	0·04	0·14	8·74	7·37	7·79	2·39	0·21	0·09	0·00	30·54
1869	0·33	0·00	0·01	0·07	0·52	4·26	4·75	10·35	9·92	2·50	0·18	1·44	34·33
1870	1·04	0·00	1·66	0·12	0·00	10·07	20·66	4·32	3·08	4·09	0·56	0·00	45·60
1871	2·06	0·02	0·00	0·00	0·47	4·96	4·53	1·69	6·01	0·09	0·77	0·04	20·64
1872	0·00	0·00	0·00	1·56	0·00	7·49	12·88	7·06	9·73	2·51	0·00	0·40	41·63
1873	0·19	0·46	0·02	0·00	1·51	5·17	6·45	6·91	8·18	0·00	0·28	0·00	29·17
1874	0·00	0·13	0·07	0·17	1·05	7·74	13·44	2·86	6·26	0·84	0·28	0·02	32·86
1875	0·00	0·42	0·02	0·15	0·07	9·08	8·95	5·72	11·06	3·27	0·02	0·10	38·86
1876	0·00	0·00	0·00	0·00	0·06	3·96	8·41	9·43	4·71	0·39	0·00	0·00	26·87
1877	1·38	0·61	0·42	0·83	0·20	5·13	6·37	7·35	3·79	2·41	0·08	1·62	30·19
1878	0·01	0·08	0·24	0·79	0·33	4·25	10·31	16·21	7·73	4·66	0·02	0·00	44·63
1879	0·00	0·38	0·00	0·00	3·18	7·52	5·72	10·73	6·99	2·50	0·00	0·00	37·02
1880	0·00	0·00	0·01	0·01	0·22	3·68	3·99	2·95	8·47	1·28	3·05	0·00	23·66
1881	0·00	0·01	1·05	0·15	0·52	10·02	10·42	8·79	3·94	1·39	1·22	0·00	37·51
Means	0·46	0·17	0·39	0·26	0·52	6·54	8·92	7·60	5·96	1·90	0·39	0·26	33·38

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera, as represented by the Death-rates registered among the Troops in Central India and Rajputana, and among the Civil Population in the Berar Province, for the Twenty Years from* 1862 *to* 1881, *together with the Average Rainfall and the Average Price of the Staple Food-grain, Millet, in the Berar Province.*

Years.	Cholera Death-rates per Mille of Strength or Population.				Average Rainfall in Berar Province in Inches and Cents.					Average Price of the Staple Food-grain in Sers and Cents per Rupee in Berar Province.
	Troops in Central India and Rajputana.			Civil Population in Berar Province.	Total of the Year in Berar Province.	Quarters.				
	European.	Native.	Total.			First.	Second.	Third.	Fourth.	
1862	5·47	?	5·47	No information.	?	...	...	...	...	28·67
1863	...	...	...		?	...	...	...	...	16·35
1864	4·45	2·37	2·93		?	...	...	...	...	16·05
1865	14·76	5·21	7·70		34·14	2·64	7·61	23·01	0·88	17·25
1866	...	0·26	0·19		23·15	0·01	4·27	17·60	1·27	15·25
1867	21·09	0·41	5·86		36·71	0·25	8·34	23·07	5·05	20·87
1868	...	0·99	0·75	2·90	30·54	3·77	8·92	17·55	0·30	22·67
1869	14·20	5·64	7·54	5·20	34·33	0·34	4·85	25·02	4·12	17·95
1870	...	...	...	0·24	45·60	2·70	10·19	28·06	4·65	22·70
1871	0·35	...	0·09	0·26	20·64	2·08	5·43	12·23	0·90	15·30
1872	9·88	2·06	4·05	0·70	41·63	...	9·05	29·67	2·91	19·80
1873	...	0·13	0·09	...	29·17	0·67	6·68	21·54	0·28	23·59
1874	...	...	...	...	32·86	0·20	8·96	22·56	1·14	30·03
1875	10·63	3·75	5·41	10·20	38·86	0·44	9·30	25·73	3·39	33·98
1876	...	0·13	0·10	1·20	26·87	...	4·02	22·55	0·30	29·30
1877	...	0·72	0·55	0·40	30·19	2·41	6·16	17·51	4·11	14·00
1878	11·52	3·11	5·04	15·60	44·63	0·33	5·37	34·25	4·68	15·00
1879	...	0·24	0·18	0·10	37·02	0·38	10·70	23·44	2·50	18·40
1880	...	...	...	...	23·66	0·01	3·91	15·41	4·33	36·40
1881	...	0·12	0·09	1·56	37·51	1·06	10·69	23·15	2·61	32·45

No. VI.—STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the Berar Province for the Seventeen Years from* 1865 *to* 1881.

Years.	Districts and Stations.					
	Amraoti.	Ellichpur.	Wún (Yeotmal).	Basim.	Akola.	Buldana.
1865	40·70	31·06	40·97	39·33*	25·95	26·88
1866	28·90	17·57	37·92	26·51	10·36	17·66
1867	18·45	33·09	69·99	31·67	30·39	36·71
1868	37·40	28·73	33·70	24·24	24·28	34·89
1869	27·30	27·22	37·75	49·05	30·00	34·67
1870	38·97	25·95	64·95	64·98	40·07	38·68
1871	23·83	17·77	27·00	17·57	17·47	20·18
1872	35·84	31·13	42·47	54·29	40·93	45·15
1873	32·30	25·11	27·47	39·31	22·57	28·29
1874	27·06	31·32	41·00	49·68	26·68	21·40
1875	32·92	27·81	58·45	49·10	34·22	30·63
1876	29·25	26·38	28·78	30·54	21·07	25·18
1877	29·20	38·99	33·51	27·88	24·32	27·27
1878	42·67	36·98	46·57	56·11	43·07	42·39
1879	34·22	32·02	44·10	42·91	25·90	42·98
1880	16·40	19·59	28·80	28·59	19·40	29·17
1881	38·93	36·50	43·35	39·35	32·65	34·30

* The average of five years from 1866 to 1870.

There are no statistics to show the monthly prevalence of cholera in this province until the year 1868, in which for the first time mortuary registration was introduced among the civil population. From its situation between the Nagpur, Wardha, and Chanda districts of the Central Provinces on the east and the Khandesh district of the Bombay Province on the west, and between the western districts of the Central Provinces on the north and the Nizam's dominions on the south, the cholera history of Berar may be considered as generally partaking of the same results as those which have been recorded for the Bombay Province on the one hand, and the Central Provinces on the other, during the period covered by the years 1862 to 1881 inclusive.

Regarding the cholera of the years 1862 to 1867 inclusive in this province no information is available. I therefore proceed to take up the history of the disease from the year 1868, in which the mortality from that cause is for the first time recorded.

1868.—The returns of the cholera mortality of this year which have been published show the deaths registered monthly for the province as a whole, and not their distribution by districts. The results, as they stand, are shown in Table No. II. The death-rate of the year, as shown in Table No. V., was 2.90 per mille of the population. It is recorded that "a considerable number of deaths from cholera appear in the returns from the Amraoti district as early as January and February, but the disease did not become epidemic until June, and even then the greatest number of cases occurred in the Amraoti district." A few deaths from cholera were reported also from Ellichpur, from Maikar circle in Buldana district, and from the Basim circles. In the course of July cholera spread over all the districts of the province, with the exception of Wún, which remained free until August.

In August the epidemic reached its height. In September it subsided greatly, but cases continued to occur in all the districts throughout October and November. "The first appearance of the disease in the Ellichpur district appears to have been due to importation by persons, probably pilgrims, returning from Ramtek, in the Nagpur district, but its introduction from

without in the other districts is not traceable." In the districts of Buldana, Akola, and Basim, "where the statistics for the two classes are given separately, the death-rates for the urban population are generally higher than the rural rates. This is contrary to what obtains elsewhere, for it is commonly found that cholera is far more destructive, in proportion to the population, in small villages than in the larger towns. Of the towns of which the statistics are given, Akola suffered a mortality of 15 per mille of the population. At Balapur the rate was 8 per mille; at Akot and Umarkhair, 7 per mille; but at no other town did the cholera rate exceed 5 per mille of the population."

The rainfall of 1868 was about 6 inches less than that of the year before, and it was about 3 inches less than the average annual fall for the province. It was also unseasonably distributed (see Table No. V.), the fall in the first quarter of the year being exceptionally heavy, whilst that in the last quarter was unusually deficient. Food in this year was cheaper than in the year before, but prices still ranged high.

1869.—Cholera in this year broke out with revived epidemic activity. The death-rate rose to 5.20 per mille of population against 2.90 in the preceding year. As in the year before, the monthly returns show the mortality registered for the province as a whole, and not distributed by districts. During the months of January, February, and March 219 cholera deaths were registered in the Akot and Akola circles, but their monthly distribution is not given. In April the disease appeared to the east of these circles, in the neighbouring circles of Ellichpur, Dariapur, Amraoti, Murtazapur, and Darwa; and to the west in the Julgaon, Balapur, and Malkapur circles. Some deaths from cholera also occurred at Basim. In May the disease appeared still farther east, in the circles of Mursi, Chandur, Yeotmal, and Wún, while in Akola and Basim few deaths from cholera occurred. In June the disease was most fatal in the Wún district and in the circles of Akot, Akola, and Malkapur and Basim.

In July cholera reached its height, and was most fatal among the rural population of Malkapur circle, where 84 per cent. of the whole deaths in this month were caused by it. In August the disease was most fatal in the circles of Malkapur, Basim, Pusad, Yeotmal, and Mursi, and deaths from cholera appeared in all the returns, except those for Barsi, Takli, and Nandura. In September the disease had disappeared from nearly all places except Pusad and Yeotmal. In October and November few deaths were returned from cholera, but the Basim returns for December show one-third of the deaths under this head. The returns for this year show that the rate of mortality from cholera is higher for the rural than for the urban population, and this in the ratio of 5.3 and 4.9 deaths per mille. "In other provinces it is generally found that cholera is more destructive, in proportion to the population, in the small villages than in the larger towns." Of the towns, Nandura shows the rate of mortality from cholera of 18.4 per mille; Dawalgaon Raja, Malkapur, and Akola, of 8 per mille; and most other towns, of under 5 per mille.

The rainfall of 1869 was more abundant than that of the preceding year, and was also somewhat above the average; it appears also to have been seasonably distributed, though locally there was much variation in the yearly amount (see Table No. VI.) The price of food in this year again went up, and rates were considerably dearer than in the year before, and verged upon famine rates. There is no doubt there was severe distress for food in many parts of the province.

1870.—A very marked abatement in the prevalence of cholera took place in this year. The death-rate fell to 0.24 from 5.20 per mille of population in the year before. In this year, for the first time in this province, the monthly distribution of deaths is shown by districts, and those occurring among males and females are distinguished. The cholera of 1870 in this province was mainly confined to the districts of Basim and Wún, which contributed respectively 266 and 204 of the total 504 deaths from cholera registered during the year.

Of the number returned from the Basim district, 118 were registered in the Umarkhair circle, and of these fully one-third occurred in the small village of Marsul, and the others mainly in a number of villages on the banks of the Penganga River, at some distance from Marsul. The water-supply of the latter villages is obtained mainly or wholly from the Penganga River.

"Marsul," writes the civil surgeon, "is one of the dirtiest villages I have seen in Berar. The outskirts of the village, banks of the neighbouring stream, and vacant places among the huts seemed to be used as the public latrines and receptacles of the village refuse. The water-supply is obtained from the neighbouring stream, and from a well which is lined with masonry. But shortly before the outbreak of cholera the lining of the well gave way near the bottom of the shaft, and the surrounding loose earth (probably from the village and saturated with excrementitious matter) got worked in from below, leaving a deep furrow which would catch all surface drainage within some distance of the well. Nearly all the deaths occurred about the same time, and all among Kunbis and others who used the well water, and not one among the low castes, who use the water from the stream. The immediate cause of the outbreak of the disease, or of its great severity in this village (killing as it did 10 per cent. of the population), may very well be attributed to the contaminated water-supply, without adopting the water theory of cholera, which in the opinion of the writer" (Dr. A. Porter) "proves too much. If the water theory were adopted in the present instance, it would seem necessary to explain how water so poisoned by cholera evacuations as to kill 10 per cent. of those using it should let off the remaining 90 per cent. without inducing even the mildest bowel complaint in most cases. But perhaps the most remarkable circumstance about this outbreak is, that the disease did not spread to the neighbouring villages. A few deaths were registered from cholera in Nagasbari, a village a mile further up the same stream, and the inhabitants of which use the water from the stream, or from a pit sunk in its bank. But no cholera appeared in Dagu, a village very similar to Nagasbari, but a mile down the stream from Marsul; nor did any case of cholera occur in Umarkhair, the market-town to which the inhabitants of Marsul and other neighbouring villages flock weekly."

Meteorology.—The rainfall of 1870 exceeded that of the year before, although the latter was above the average. The main increase in the rainfall occurred in the months of June and July.

Regarding temperature it is stated—

"The mean temperature of January is higher for 1870 than for 1869 or 1868, from the nights being cloudy and warm in 1870, the day temperature being lower than in 1869, but not less than in 1868. February, March, April, and May are coolest for 1870, from the comparatively cold days and nights, due to the heavy rainfall in the latter months of 1869, and are hottest in 1869, from the absence of rainfall during the last four months of 1868 having had the opposite effect. June and July are coolest for 1870, from the heavy rainfall in these months lowering both the day and night temperatures, and these months are hottest for 1869 from the opposite cause. August has the effect of previous heavy rainfall extended to it, making days and nights cooler in both 1868 and 1870, although the rainfall in this month of 1869 exceeds that in either of these years; and the same cause still keeps the temperature of September lowest for 1870, but does not prevent it from being highest for 1868. October and November are coolest for 1869, the heavy rains of August, September, and October of that year lowering both the day and night temperatures, and are hottest for 1868, from the opposite cause, affecting principally the temperature of the day. December is coolest for 1870, from the heaviest fall of rain having occurred for this year after September, and is hottest for 1869, from the nights being cloudy and warm. The daily range of temperature for 1870 differs in many respects from that of the two previous years. . . . For January the daily range for 1868 and 1870

are nearly equal, but less than in 1869, probably from the absence of rainfall during the last four months of 1868, causing a high day temperature in January 1869. For February the mean daily range in 1870 is higher than in either of the previous years, on account of cooler nights, the comparatively low range for February 1868 being accounted for by the heavy fall of rain that occurred in January of that year lowering the day temperature. For March the ranges for 1869 and 1870 are nearly equal, and still higher than that for 1868. For April the range is nearly equal for all three years, but rather lower for 1869. For May the daily range is much lower in 1870, on account of there being more clouds, and so cooler days and warmer nights, than in either 1868 or 1869. And for the remaining months of the year the daily range keeps much lower for 1870, on account of the comparatively heavy rainfall, and consequent equable temperature, both days and nights being cooler for 1870 than for 1868 or 1869, except for October and November, in which the low range is caused by warm cloudy nights, the day temperature in these months being quite as high for 1870 as for 1869, though not as for 1868." (Blanford's Meteorological Report.)

With regard to the prices of food, it is recorded that the comparatively heavy rainfall in 1869 brought with it an abundant harvest. Consequently food was abundant in 1870, and considerably cheaper than in the previous year, when scarcity in other parts of India drained Berar of its surplus grain and kept the prices high; and this seemed to affect the market in 1870, as, notwithstanding the abundant harvest in the previous year, the prices in 1870 were above the average. "However, labour was plentiful and wages good, so that the high prices of food did not tell on the health of the people."

1871.—In this year also cholera continued at a very low rate of prevalence, the death-rate being much the same as that of the preceding year, with a slight tendency to rise, the figures being 0.26 per mille in this year against 0.24 in the year before. Of the 581 cholera deaths registered in 1871, all except 5—viz., 2 in Amraoti and 3 in Wún—occurred in the Akola, Buldana, and Basim districts. Out of 130 registration circles in the province, 29 only recorded cholera, and of these all, except 2 in Amraoti and 1 in Wún, were in the other three districts above named.

The cholera epidemic of 1870 in the Wún district, which had subsided from its maximum mortality in September and October to a single death in December of that year, was followed by 2 deaths in January and 1 in February in 1871, and then the disease disappeared in this district for the rest of the year. In the Buldana district the cholera epidemic of 1870 had ceased entirely by the end of that year, and the district remained free of the disease during the first six months of 1871. The next cholera deaths of the year occurred in the Amraoti district in the month of April, 2 in number, 1 in Kolapur circle, and the other in Kolapur town; and these are the only deaths from cholera recorded in this district throughout the year. In no other part of the province was there any sign of the presence of cholera during the first five months of 1871. In May, as was the case in the preceding March, there was no report of cholera anywhere in the province.

But in June the epidemic of the year commenced its course with an outbreak in the Akola district, where 45 deaths were registered, but none anywhere else in this month. In July cholera increased in Akola district, and appeared also in the Buldana district, whence 58 deaths were reported in that month. In August the disease continued in these two districts, but a single death returned from Basim marks the appearance of cholera in that district also. In Akola district the epidemic suddenly subsided, and ceased with 49 deaths in August. No other death from cholera was reported in this district during the next two months, but the presence of the disease is indicated by

4 deaths in November and 1 in December. In the Buldana district cholera prevailed with greater severity and steadier persistence; the maximum mortality was attained in September, and then the disease gradually abated, but was still present at the close of the year, 14 deaths being registered in December. In the Basim district the disease ran a regular but mild course, culminated in October, and subsided in December. The district of Ellichpur remained exempt throughout the year. The year 1871 began with 2 deaths from cholera in January, and ended with 16 in December; the corresponding numbers for the preceding year are 4 and 4 respectively.

In regard to the appearance of cholera in the Akola district, it is recorded—"The first case that occurred was in the person of a Bania who arrived" (in the town of Akola) "from Bombay on the 5th June. On the following day he was attacked by the disease, and eventually recovered. The disease was at its height from the 10th to the 23d June, during which time 34 deaths are reported, and cases occurred sporadically afterwards till the 30th November, when the disease ceased. In all, 62 deaths are reported. The people of Akola are mainly dependent for their water-supply on shallow wells sunk in the bed of the river, which is dry during the hot seasons; and it will be observed that the first case occurred a day before the first fall of rain, which washed into the river all impurities lying on its banks. No cases of cholera were reported from Taznapet, on this side of the river, which is supplied with water from wells." Of the 4 deaths registered in November, all occurred in the persons of travellers, one of whom had come from Hingoli, and the other three from the Buldana district.

Regarding the appearance of cholera in the Buldana district—

"The first cases appeared in the town of Malkapur, 60 miles west of Akola by rail, and situated on the banks of the Nalganga, which is dammed up to keep the water in, and which, above the anicut, receives most of the drainage of the town. It is from this source that the inhabitants get water for drinking purposes, as all the wells except two are brackish. . . . The disease broke out first in the north-western portion of the town, which is close to the river, flooded every year when it rises, and damp. The houses of a poor description, greatly crowded together, and inhabited by a poor class of Mohammedans. During the first night of the appearance of the disease, the 11th July, 15 cases were reported. The greatest number of deaths occurred during the week ending the 20th July, and the last on the 10th August; in all, 44 deaths are recorded. Shortly after the appearance of the disease in Malkapur cases were reported from other parts of the district."

The rainfall of the year 1871 was very greatly in defect; it was less than half the quantity measured in the preceding year, and was nearly 13 inches below the average fall. It is the lightest fall recorded in any year of the series from 1865 to 1881 inclusive, and is only approached by the light falls in 1866 and 1880. Its seasonal distribution, also, was very irregular, an unusual amount having fallen in the first quarter, and very little in the last. The country generally suffered from severe drought, and "the last seven months of the year, owing to the small rainfall, were extremely hot and dry; the mornings and evenings were devoid of their wonted freshness, and the nights were close and warm."

The price of food in this year was very high, and touched famine rates; the average price of the staple food-grain rose to 15.30 sers the rupee from 22.70 sers in the year before. Yet there was no actual want experienced by the people in this year, owing to the abundance of labour and good wages throughout, the wages for artisans being one rupee *per diem*, and for unskilled labourers a fourth of that amount. In the Buldana district there was some distress, owing to high prices of food and low rates for labour.

The district officer reports—"The privations of the people have been such that men offered themselves for two annas (one-eighth of a rupee) a day, and even 1½ annas a day, I believe." In the Basim district there was also distress experienced. "Owing to the prevailing drought and straitened circumstances of the inhabitants, the services of able-bodied men can now be obtained for nearly half the money paid six months ago. From want, and water-supply daily becoming less, it is reported that about 2200 people have already left their villages. At the same time, there is no immediate fear of famine." In Akola also there was distress. "Rice is almost at the same rate as last year. Wheat has risen from 17 to 12 sers the rupee, and joari from 36 to 17, compared with the prices holding last year. These prices affect the poorest classes severely. The agriculturists, having received nearly double for their cotton this year, are better off."

1872.—There was a distinctly marked increase in the prevalence of cholera in this year as compared with that in the year before, although the disease was still weak as an epidemic, the death-rate of the year having risen only to 0.70 from 0.26 in the preceding year. As in 1871 so in 1872 cholera in this province was limited as an epidemic to the season of the south-west monsoon. During the first half of both years the province was singularly free from the disease, and in each year the epidemic commenced activity in the month of June, though not in the same district in both years. In 1871 the epidemic commenced its activity in Akola district, in 1872 in Amraoti district, in both years in the month of June. In July 1872 the disease broke out in all the other districts except Ellichpur, but in 1871 it affected only the districts of Akola, Buldana, and Basim. In 1871 the Ellichpur district remained wholly exempt throughout, whilst in this year it recorded only 8 cholera deaths, viz., 2 in September and 6 in October. In both years the epidemic ceased at the end of the rains, but in some places lingered on to the close of the year. In 1872 the disease had almost disappeared from the province in November, only 4 deaths being registered in that month, viz., 2 in Wún and 2 in Buldana; but in December the disease flickered up afresh in Wún, where it caused 13 deaths in that month, and reappeared in Amraoti, where 2 deaths were registered before the close of the year. In all other parts of the province there was no sign of the presence of cholera during November and December. The year 1872 began with 5 cholera deaths registered in January, and ended with 15 in December; the corresponding figures for 1871 are 2 and 16 respectively.

Meteorology.—The rainfall of 1872, as compared with that of the preceding year, which was a year of drought, was most plentiful all over the province. Owing to the scanty rainfall in 1871, the first months of the year 1872 were remarkably hot and dry. The mean temperature of the year is given at 80.2° against 79.6° in 1871, and the mean daily range of temperature at 24.0° against 23.8° in 1871.

With the object of testing Professor Pettenkofer's theory of cholera, the depth of water in the jail wells at Akola, Basim, Amraoti, Yeotmal, and Ellichpur was recorded once a week during the year 1872. The results are thus summarised:—

Akola.—"In the beginning of 1872 the water was only 2 feet 6 inches deep in the Akola jail well, and from this it gradually diminished to 1 foot 5 inches on the 4th of May. The highest level was reached (30 feet) on the 12th October, and then it began to fall, leaving it at 22 feet 3 inches at the end of the year, as compared with 2 feet 6 inches at its beginning. The depth of the well in which these observations are taken is 36 feet 6 inches. The soil is trap."

Basim.—"At Basim things were worse. Only 5 inches of water were in the well, 41½ feet deep, at the beginning of the year; and this small quantity was reduced to 2½ inches in March. The rainfall in April caused it to rise a little, but it again fell in June, before the rains, to 2 inches. The maximum water-level (35 feet 4 inches) was reached in August, and at the end of the year it was 21 feet 8 inches, as compared with 5 inches at its beginning. Soil trap."

Amraoti.—"The Amraoti jail well is 24 feet deep, in trap soil; 8 feet 3 inches of water was in it at the beginning of the year, and 5 feet 2 inches at its close. The water-level fell to 1 foot in the beginning of June, and the highest level reached is 12 feet, at which it stood from the middle of July till half of December was over."

Yeotmal.—"This well is 34 feet deep, in trap soil. The water-level at the beginning of the year was 12 feet, at its close 18 feet; the lowest level, 2 feet, was in June, and the highest, 26 feet, in October."

Ellichpur.—"Soil alluvial; depth of well, 21½ feet. Water-level at beginning of the year, 4 feet 7 inches; water-level at close of year, 8 feet 5 inches; maximum in September, 12 feet; minimum in April, 3 feet 5 inches."

These observations show that the well-water supply of Berar is derived altogether from surface drainage, "and that there are no deep springs in the country." They also well illustrate the effects of a year of drought upon the subsoil water-level of the country.

Food was considerably cheaper in this than in the preceding year, the average price of the staple food-grain having fallen to 19.80 sers the rupee from 15.30 sers in the year before. The drought of 1871 would have affected the people more seriously than it did, had it not been for the grain stored in the country and the quantity imported by rail from other and more favoured provinces. By these means "there was quite enough grain in the country for its wants; but it was expensive, and the poorer classes found it difficult to get money to purchase." Apart from this, there was a general scarcity of water, "and this affected the people to a severe extent. Some villages were deserted for want of water, and in many places the inhabitants had to go great distances for this necessary of life, and then it was only procurable in small quantities. . . . The drought of 1871 affected the cattle to an alarming extent. Water for them to drink was very scarce, and in too many instances, when procurable, unfitted for drinking purposes. Fodder, too, was scarce, and sold at unprecedented high prices. . . . From inquiries made, . . . the loss of cattle, roughly computed for the time, shown against each district was—

Basim district . . .	181,465,	from January to August 1872.
Buldana ,, . . .	101,074,	,, ,, ,,
Akola ,, . . .	105,563,	,, ,,
Wún ,, . . .	29,698,	,, March to August.
Amraoti ,, . . .	36,268,	,, January to June.
Ellichpur ,, . . .	12,243,	,, March to December.

"This great mortality among their cattle indicates the enormous extent to which the agriculturists are impoverished by a season of drought and deficient water-supply. The years 1860 and 1862 were also years of drought in Berar, but whether as great in severity as that of the year 1871 is not known. In 1872 the condition of the people varied in each district. Where the monsoon of 1871 was favourable they were better off, and where it was unfavourable they were badly off; and where the people were very badly off, work was provided for those who required it."

1873.—No death from cholera was recorded in this year in any part of the province, a similar immunity not being known since the introduction of death registration in 1868. The year 1873 is also marked by "a remarkable decrease in the mortality from 'fevers,' 'bowel complaints,' and 'all other causes,' and an increase in it from 'injuries,' as compared with the previous year;" whilst the epidemic of "smallpox," which commenced in November 1871, in March of this year reached its climax, and then steadily subsided to the close of the year, and finally terminated in October 1874, when only 23 deaths—the lowest mortality from this cause in any one month on record in the Berar Province—were registered.

Regarding the prevalence of smallpox in the Berar Province, it may be here noted that the mortality from the disease in the year 1868—the first year of death registration in this province—was at the rate of 1.90 per mille of population; in 1869 the rate was 3.60, in 1870 it was 0.63, and in 1871 only 0.20. In 1871 the total number of smallpox deaths registered amounted to 601, against 1394 in the year before, and of these 601 deaths, 169 occurred during November and December. The epidemic of smallpox, which was in progress in 1868, when registration was first introduced, finally ceased in 1871, the mortality having gradually fallen, with the characteristic seasonal fluctuations, to 26 deaths in September and 31 in October of that year. In the following month, November, a new epidemic of smallpox commenced, with 73 deaths registered in that month, and 96 in the month following. During the first three months of 1872 the deaths rose to 316, 496, and 788 respectively, and during the next three months the disease prevailed at its maximum intensity of the year, the deaths registered being 1047 in April, 1413 in May, and 1464 in June. After this the epidemic steadily abated, and the mortality fell to the minimum of the year, with 199 deaths in October and 208 in November; but in December the disease acquired fresh activity, and started on a new epidemic career, the deaths in that month rising to 511. In the first four months of 1873 the epidemic prevailed at its maximum intensity, the deaths registered being 1201 in January, 1389 in February, 2059 in March, and 1516 in April. During the succeeding months the disease continued steadily abating, and subsided to the lowest mortality of the year, with 74 deaths in September, 77 in October, and 73 in November. In December, again, smallpox acquired fresh activity, and the deaths in that month rose to 101. During the first five months of 1874 the disease continued to prevail at a slightly increasing rate, the culminating point being attained in April, with 177 deaths in that month. From this onwards the mortality steadily diminished, and fell to the lowest figure, 23 deaths, in October. This is the lowest monthly mortality on record from this disease in the Berar Province, and with it the epidemic, which commenced in November 1871, finally ceased; the deaths from smallpox in November and December 1874 being 35 and 33 respectively.

The course pursued by this epidemic well illustrates the ordinary seasonal prevalence of smallpox, and is here introduced for the sake of comparison with the course observed in respect to the mortality from cholera, not only in this province, but also in all the other provinces of India. The main points of difference between the two diseases, in respect to the seasons of their epidemic activity, are, that dry weather favours the prevalence of smallpox and wet weather retards it, whilst the converse holds with regard to cholera; that the rise and fall in the prevalence of smallpox is more steady and regular than is the case with cholera; and that its attacks are mainly confined to the infantile population, by reason of its adult members being

mostly protected by previous attacks of the disease, or by its communication through inoculation or vaccination, in which respects there is no similarity between the characters of smallpox and cholera.

Meteorology.—The temperature of the atmosphere was below the average of the previous two years.

The great tightness experienced in 1872, in consequence of the drought in 1871, was followed in 1873 by abundant and cheap food, and wages at stationary rates, that is to say, in no way reduced in proportion to the reduction in the price of food. This improvement in the condition of the people in 1873, as compared with the previous year, "had a marked effect on the death-rate among them, reducing it from 37.1 per mille in 1872 to 22.8 in the year under report."

1874.—Again in this year the province remained free of cholera, only two deaths from that cause being registered during the twelve months, both in April, in the Malkapur circle of the Buldana district. In this singular immunity from epidemic cholera during the triennial cycle of 1872–74, the Berar Province participated in the good fortune of the Bombay and Madras Provinces, and indeed of Southern India generally, for during these three years cholera was in profound abeyance throughout the Southern Peninsula.

In 1874 the rainfall was more abundant than in the preceding year, but was still somewhat below the average. Food, however, was abundant and cheap—much cheaper than in the year before, in the proportion of 30.03 sers the rupee to 23.59 sers respectively for the staple food-grain. As had been experienced in previous years, the rainfall of 1874 was very unequally distributed, some place or other in each year receiving a fall much below the average, and others a fall much above the average. Humidity was less than in the preceding year at Akola and Buldana, but it was more at Amraoti. Temperature was higher in 1874 than in 1873.

"At Akola the mean readings of the barometer and hygrometer were below the average of the previous year, while the mean temperature was higher than in 1873. At Buldana the barometric and hygrometric mean readings were below, and those of the thermometers in the air above, the average of the previous year; while at Amraoti temperature and humidity were above the average of 1873, and the mean barometric observations below it."

The weekly register of subsoil water-level in one well in each of the five jails of the province for 1874 is confirmatory of the experience of the preceding year from these observations, namely, that the quantity of water in these wells depends entirely on the rainfall.

1875.—Cholera in 1875 resumed epidemic activity, and prevailed all over the province with extreme severity. The cholera deaths registered during the year amounted to 22,465, giving a death-rate of 10.20 per mille of population. The absence of the disease, which was so absolute during the two preceding years, was maintained during the first four months of 1875, and up to the end of April there was no report of cholera in any part of the province. In May, however, the disease burst out in considerable initial severity in the Akola and Buldana districts, and in the next month overtook the other districts, except Wún, in which it did not appear until July. In all the districts the disease ran a violent epidemic course, the general maximum intensity being attained in July, and finally subsided during October and November, the province being again entirely free of cholera during December.

The first appearance of cholera in 1875 in the Berar Province was on the 9th May, in the village of Takli, on the banks of the Purna River, in the Buldana district, and "within the following week or ten days it had attacked the inhabitants in a number of the neighbouring villages. . . . During May it appeared in 9 villages in the Buldana district, and in 28 in the Akola district, the total number of deaths being 249. In June the disease had extended to 366 villages in the Akola district, and to 80 in Buldana; and had advanced also into the Ellichpur and Amraoti districts, to 5 villages in the former and to 2 in the latter, the total mortality for the month being 3625. The following month showed a still further advance of the epidemic to 504 villages in Akola, to 371 in Buldana, to 208 in Ellichpur, to 133 in Amraoti, besides its having extended into the Basim district, attacking 98 villages, the mortality for the month being 10,374. In August the disease began to abate in the Akola, Buldana, and Ellichpur districts, the number of villages in which it was present in these being 220, 219, and 114 respectively; but it still advanced eastward, and was present in 253 villages in the Amraoti district, 155 in the Basim district, and appeared in 127 in the Wún district. The total number of deaths from cholera registered was 5840. September saw the last of the disease in the Akola district, it having disappeared by the end of the month out of the 30 villages affected. In the Buldana district the number of villages attacked fell to 44; in the Ellichpur district, to 30; but in the Amraoti and Basim districts the decline of the epidemic was not so marked, while in Wún it advanced, the number of villages in which it was in each district being 192, 76, and 217 respectively. Total mortality, 207. In October the decline of the epidemic was still marked, being present in only 5 villages in Buldana, 2 in Ellichpur, 5 in Basim, and 10 in Wún, and it became extinguished in these before the end of the month; but in the Amraoti district it continued, and was present in 43 villages, the total number of deaths recorded being 318. The number of villages attacked in Amraoti in November dwindled down to 8, and from these the disease disappeared before the end of the month, the mortality in these being 39; and 13 deaths were reported from Wún, but the names of the villages they occurred in were not given." In the subjoined abstract statement are shown the number of villages in each district, together with the number not affected by cholera, and the total number of cholera deaths registered from the commencement of the epidemic in May to its termination in November.

District.	Total Number of Villages.	Number of Villages Affected.	Total Number of Cholera Deaths.
Buldana . . .	918	399	6,418
Akola	987	272	7,847
Ellichpur . . .	480	219	2,107
Amraoti . . .	1,090	626	3,163
Basim	799	551	1,165
Wún	1,184	?	1,765

"The general direction of the epidemic was from west to east. At times, however, it appeared to move in waves, sometimes the back wave taking in villages which the front wave had passed over; at others it looked as if it were sending offshoots, some in advance, others laterally, and others again obliquely. Nevertheless the advance of the disease was clearly eastward, and its passage—that is, the interval between the date of the first

case in Berar and the first case beyond our eastern border in the Central Provinces—through the province (ninety miles) occupied sixty-six days." As regards the spread of the disease by human agency, Dr. R. T. Abbott, the Sanitary Commissioner, Haidarabad Assigned Districts (Berar), from whose valuable report the above quotations are made, visited a number of villages in which cholera first made its appearance, and made careful inquiry into the circumstances of each outbreak. He says—

"In Takli, Dudgaon, Assalgaon, and other villages where the disease first appeared, the evidence clearly pointed towards importation. Thus, briefly, in Takli a Manbhao, from where the disease was prevalent, came on a visit. He was ill on arrival, and two days afterwards the disease appeared in Takli. Again, a Manbhao, who was ill at Takli, thought a change would do him good, and had himself removed to Dudgaon, where he died; and in two days the disease broke out here also. The evidence in respect to Assalgaon was to the same effect. At Akola, Khamgaon, and Basim towns it was also in favour of importation, as in many other villages I visited; but in an equal, if not greater, number there was no evidence whatsoever in favour of importation."

Regarding the effect rain may have on the disease, Dr. Abbott had a statement prepared showing the rainfall and attacks and deaths from cholera day by day during the epidemic at eleven places, to see if it would throw any light upon the subject; "but," he says, "I learn from it that a local fall of rain has no effect whatsoever on the disease. It neither causes the attacks or deaths to increase or decrease, nor does the want of rain either have any effect on it." As regards the meteorology of cholera, the statistics prepared by Dr. Abbott "show that the mean temperature was greater in cholera than in non-cholera years, but by no means show that cholera was due to great heat, as, if they did, we might expect some parallel between the mean monthly temperature and the monthly mortality from cholera, which we do not meet with. Again, if it were so, why was not the mortality from this cause as great in 1872 as in 1875?" In respect to humidity, he writes—"It appears that cholera years were moister than non-cholera years; but as with temperature so with moisture; increased moisture does not necessarily bring with it more cholera, as, if it did, the mortality in September 1872 would have been much greater than that of September 1875, whereas it was not." Regarding barometric pressure—"The idea that barometric depression is a precursor of cholera appears to have some truth in it. On the whole, it may be said that the tables prove that atmospheric phenomena do not influence the advance or decline of an epidemic, although they account for its peculiar deportment. Thus its dormancy in the cold weather may be attributed to atmospheric conditions, and so on with its other phases; but there is nothing to show that any peculiar conditions give life to the epidemic in Berar."

In 1875 the first four months were characterised by a continuance of unusually low barometric pressure, whilst the temperature and humidity were variable, but with a tendency to excess over the readings of previous years. May was the first month in which the readings of the barometer were higher than usual, but in June the barometer again showed depression, whilst the temperature and variation of temperature continued higher in both months, humidity being less than usual in May, but more in June, in which month the monsoon set in, and rain was registered at all stations. In July the pressure varied, but the temperature throughout the province was less than usual. In August the mean readings of the barometer were higher than usual. The mean temperature was also generally higher, and the variation of temperature and humidity was also generally higher. October was remarkable for high barometric pressure, low temperature, decrease of variation of

temperature, increase of humidity, and the wind varying to the east. The monsoon terminated in this month, but rain was registered at all stations. November was characterised by high mean barometric pressure, high temperature, and humidity generally, with decrease of variation of temperature. In December the mean barometric pressure was less than in the corresponding month of 1874. The temperature was higher, as was also the humidity, and the variation of temperature was less throughout the province. The "monthly means," though not an exact index to the meteorology of any particular locality in the province, still serve to indicate the general character of the meteorological phenomena which obtain over the area of the country.

The rainfall in 1875 was abundant, and generally distributed; it much exceeded the fall of the preceding year, and was also much above the average. Food in this year was remarkably cheap, cheaper than in any previous year of our series, and is surpassed in lowness of price only in the year 1880.

1876.—Compared with the experience of the preceding year, there was a very marked abatement in the prevalence of cholera in 1875. The death-rate fell to 1.20 from 10.20 in the year before. In the Ellichpur district 900 cholera deaths are reported to have occurred in 1876, but their distribution by months is not given. Cholera was prevalent also in Mailghat—the hill district of the province, north of the valley of Berar, and drained by the Tapti and its tributaries—both in 1875 and 1876; but this part of the province not being under registration, no statistics of its cholera mortality are available. As in previous years so in this there was no report of cholera in any part of the province during the first four months of the year. In 1876 cholera first appeared in the month of May in the Wún district, where 19 deaths were registered in that month. In June the disease continued in Wún, and the deaths rose to 109; the other districts—leaving Ellichpur, for which the returns are not available, out of the account—returned no cholera in this month. In July the disease appeared in Amraoti, Basim, and Buldana, but not until October in Akola. In all the districts cholera ran a steady epidemic course, attained maximum intensity during September and October, and declined towards the end of the year, but was still present in more or less activity in all the districts in December, the total deaths in that month being 152.

Before the appearance of cholera in Berar in May 1876 the disease was known to be prevalent in the Central Provinces—in the Betul district to the north, and in the Chanda district to the east—and also in the Nizam's dominions to the south. On the 17th May cholera appeared in Berar at the village of Devala, to the south-east, in the Wún district, and before the end of the month the disease had extended to seven villages and killed nineteen of the people. In the same month cholera appeared from the north in the Ellichpur district; "but as in this district all deaths from it," writes the Sanitary Commissioner, "have been recorded under a different heading (bowel complaints) in the Mortuary Register, I cannot write of it with certainty. This much I may say, viz., that the disease had become very general over the district in July, and disappeared by the end of September or during October." In June 109 deaths were reported from twenty-two villages in the Wún district, "the advance of the epidemic being towards the north-west."

In July the disease "spread south from Ellichpur, and entered a village in the Amraoti district, where it killed four people. Its progress in the Wún district continued, and it attacked us from a new quarter, the south-west and west in the Buldana district, and passed on quickly to the Basim district. But as yet the mortality, 142, was not very great, and the people of only thirty villages were affected. In the Wún district in August,

though there were a few more deaths reported than in July, it was present in fewer villages; while in the other districts, especially the Amraoti one, the advance was marked, more villages were attacked, and the deaths in all had mounted up to 469. In September the epidemic continued to decrease in the Wún district, but became more extensive in the other four districts, and had spread from the east to the Akola district by the end of the month. The deaths in this month numbered 662, and the number of villages attacked 100. October saw a further decline of the epidemic in the Wún district, and the beginning of it in the Buldana and Basim districts, as also a falling off in the number of villages attacked in the Amraoti district, while its advance in the Akola district continued. The number of deaths in this month was 720, and the number of villages attacked 95. November witnessed a fall in the mortality to 410, and in the number of villages affected to fifty, but still it was present in all five districts. And in December the epidemic became extinguished, except in one place in the Basim district, where it lingered on till January. In December 152 people died in nine places."

The differences in the course of the epidemic of 1875 and 1876 are thus summarised:—

Cholera of 1875 compared with that of 1876.

Cholera Details.	1875.	1876.
Time of appearance	9th May	17th May
From whence it came	West	N., SE., S., and SW.
Course it took	East	Centered on Berar
Duration	Till November	Till January 1877
Its advance	Quick	Slow
When it reached its height	July	October
Its decline	Rapid	Slow
Number of villages affected	2,431	391
Number of circles affected	131	104
Mortality	22,465	3,583*

* Including 900 in Ellichpur district.

Although the cholera of 1876 was as general as the cholera of 1875, the disease in the latter year caused seven times more mortality, "indicating pretty clearly," writes Dr. Abbott, "that the first tide of the epidemic had cleared away most of those susceptible of the disease, and that, therefore, fewer were attacked in 1876." The progress of the epidemics of 1875 and 1876 is shown in contrast in the following statement:—

STATEMENT *showing the Number of Villages Affected by Cholera in* 1875 *and* 1876 *in each District of the Berar Province.*

Districts.	Number of Villages in District.	Number Affected in 1875.	Number Affected in 1876.	Number Affected in 1875, and again in 1876.	Number of New Villages Affected in 1876 and not in 1875.
Amraoti	1,060	434	121	64	57
Ellichpur	475	256	?	?	?
Wún	1,222	293	123	36	87
Basim	796	245	84	35	49
Akola	980	708	38	25	13
Buldana	894	495	25	14	11
Total	5,427	2,431	391	174	217

The return shows that in 1875—the first year of the epidemic—2431 villages out of 5427 in the province were affected by cholera. In the succeeding year—the second of the epidemic—the number of villages affected (exclusive of Ellichpur, for which no returns are furnished) is only 391. Of this latter number, 174 had been affected both in 1875 and again in 1876, and 217 were newly affected for the first time during the epidemic of 1876. In the Mailghat or hill country of Gawilgarh cholera prevailed in both these years, as before mentioned.

The rainfall in 1876 was greatly deficient in quantity, the average fall of the year being only 26.87 inches, the average annual fall being 33.38 inches. It was 12 inches less than the fall in the preceding year, and is exceeded in defect by the falls only of the years 1866, 1871, and 1880 of the whole series of years from 1865 to 1881 inclusive. The main features of the meteorology of the year 1876, as compared with 1875, may be stated to be—higher temperature throughout the year, decrease of humidity throughout the year, increase of barometric pressure, except during the last three months of the year, and decrease of rainfall. It is observed that the barometric depression which was the distinguishing feature of October was accompanied by an increase in the number of deaths from cholera.

There was a considerable rise in the prices of the staple food-grain in this year, but still prices were not dear. At the beginning of the year food was cheap, and there was no scarcity of labour throughout the year. But during the latter half of the year prices ranged high, on account of the large exportations to the Bombay and Madras Provinces, owing to the failure of the rainfall in many parts of Bombay and Southern India. Upon the poorer classes of the people this state of things bore with considerable pressure, but this varied much in the different districts.

1877.—Cholera in this year, pursuing its normal cyclical course, subsided to a minimum of prevalence. The death-rate fell to only 0.40 from 1.20 in the preceding year, and 10.20 in the year before that. Compared with the course of the disease in previous years, the prevalence of the cholera of 1877 presents some noteworthy differences. In the two preceding years the province of Berar was absolutely free from cholera during their first four months; but in this year no month, excepting February alone, failed to show the presence of the disease in some district or other. As we have seen, the epidemic of 1876 ceased with the close of that year in all the districts except that of Basim, in which the 27 deaths in December 1876 were followed by 14 in January 1877, when the epidemic finally ceased in that district also, no other death from cholera being reported from it during the next four months. In February no cholera death was reported in any of the districts. In March 29 deaths were reported from the Akola district, and none from any of the other districts. In Akola district the first death was reported on the 2d March, and the last on the 30th September; the highest mortality was attained in May, and the next highest in August and September, but in no month did the deaths reach 100. In April cholera appeared in Amraoti district, and after a mild and fluctuating course, finally ceased in October. In June the disease appeared in Ellichpur, Basim, and Buldana districts. In Ellichpur it finally ceased in September, with a total of 48 deaths; in Buldana in November; and in Basim lingered to the end of the year; but 10 deaths were registered in December against 3 and 5 in November and October respectively. In the Wún district cholera did not appear till August, and after a short and sharp course, disappeared in October; total deaths, 74. At the close of the year all the districts were free of the

disease except Basim. The total cholera mortality of the year is 842; the highest number of deaths was in September, 203; August, 194; June, 131; and May, 123.

The meteorology of 1877 was different in many respects from that of the preceding year. The mean barometric pressure was 1.52 less than in 1876. The mean temperature of the year was 6.3° less than that of the year before. It was less throughout each month of the year, the thermometer indicating as much as over 10 degrees less of heat in four months of it than in the corresponding months of 1876. The rainfall was a very remarkable feature in the meteorology of the year. It rained in every month, and the fall exceeded that of the preceding year by more than three inches. In 1876 almost the whole of the rainfall fell in the monsoon season; in 1877 somewhat over two-thirds of the fall were registered in that season.

"There was also a remarkable difference in the wind directions of the two years. Of these, it may be said generally that easterly winds predominated during the first two and last three months of the year 1877, and during the intermediate months the winds were more northerly in their direction than in 1876. These peculiarities in the wind directions of the year account for the way in which the rainfall was distributed over it, and, combined with it, for the low temperature of the year. Thus the prevailing easterly winds at the beginning and end of the year brought rain with them, which usually does not reach us, and the northerly winds in the intermediate months kept back the south-west monsoon rains, on which our supply depends. Further, the easterly winds bringing up moisture with them account for the comparatively low temperature in the months in which they blew; and the northerly winds in the other months, coming from the snow-clad Himalayas, brought more cold with them than the usually westerly winds would have."

The rainfall of 1877, though considerably more than that in the preceding year, was, at the same time, to an equal extent less than the average fall.

Food in 1877 was very dear, and prices ruled at famine rates.

"The harvest reaped in 1876–77 was a fair average one, and before it was gathered there was a very large supply of grain stored in the country. But the famine which raged throughout the year in Southern India and over a part of the Bombay Province threw a great strain on Berar as regards its grain-supply. Food-grains, which began to be exported in November 1876, were exported throughout the year; and when the *kharif* (autumn) harvest of 1877–78 was ripe, it was considered that there was not more than a four months' supply of grain in the province for all the inhabitants. Fortunately, however, for them, though the monsoon rains of 1877 were so scanty, they fell seasonably, and, on the whole, an average harvest has been reaped. The price of grain, which began to run up in the latter months of 1876, when the famine in the south became known, continued high throughout the year. At one time, when it was feared that we might have a famine in our own land, they ran up very high indeed; but fortunately this condition of things did not last very long. . . . Nevertheless grain was very dear throughout the whole year, and this must have told hard on some of the poorer classes, who have to purchase grain; and to meet such cases in some places relief works on a small scale were started."

1878.—In this year, the first of the next triennial cycle, cholera broke out on a fresh course of epidemic activity, and, aggravated by the effects of unfavourable weather and scarcity of food, prevailed with unprecedented severity. The death-rate rose to the high figure of 15.60 per mille of population, or more than half as high again as the unusually high rate in 1875, the first year of the preceding triennial cycle. The total number of cholera deaths registered in 1878 is 34,306, against only 842 in the year before. The disease is said to have travelled upwards along the Godavari and its tributaries, and to have entered Berar through the Nizam's territory. The general direction of the epidemic, it is stated, "was north and north-west, in a contrary direction to the prevailing winds."

The cholera of 1877, as we have seen, ceased in all the districts of

Berar before the close of that year, except in Basim, in which district 10 deaths were registered in December; these were followed by 2 more in January 1878, and then the disease finally ceased in that district also. During the first three months of 1878, excepting a single death recorded in February in Amraoti district, there is no other sign of the presence of cholera in any part of the province.

In April the epidemic of the year burst into activity, and during that month the disease became prevalent in the districts of Wún, Basim, and Buldana. In May it progressed rapidly in these districts, and appeared also in those of Akola and Amraoti. In June cholera continued active in all the affected districts, and in July, still progressing in them, appeared also in Ellichpur district, and thus overspread the whole province. In each district the disease ran a more or less unusually violent course of not less than seven months' duration, except in Ellichpur, where the period of its later commencement curtailed it to six months, whilst in Wún and Amraoti the course was prolonged to eight months. The period of maximum intensity was July and August, and in the latter month the climax was attained. In September a sudden and great abatement occurred, and the disease, continuing to subside in rapid falls, ceased in all the districts, except Ellichpur and Amraoti, before December. The violence of the epidemic varied greatly in the different districts; in Basim district the mortality was at the rate of 42.30 per mille of population; in Buldana the rate was 20.20; in Wún it was 15.10; in Amraoti, 9.60; in Akola, 9.00; and in Ellichpur, 4.80 per mille. The disease attained its maximum intensity in June and July in Basim, in July and August in Buldana and Wún, and in August in the other three districts; and it ceased entirely in October in Basim and Buldana, in November in Wún and Akola, but was still present during December in Amraoti and Ellichpur. The year began with 2 cholera deaths in January, and ended with 58 in December; the corresponding figures for the year before are 14 and 10 respectively; the total deaths of the two years being 34,306 in 1878 and 842 in 1877.

Exclusive of the 2 deaths in January and 1 in February, "the first report of cholera was received from the Wún district, where it broke out on the 1st April at the village of Saorla, in the Wún circle. The first case was that of a boy ten years of age." The disease appeared at the village of Wún, about five miles distant, on the 6th April, and in the Kayar and Dhanora rural circles on the 12th April. In May it appeared in five other rural circles of this district, in June in eight others, in July in eight others, and in August in two others. In the twenty-six circles affected, the number of villages is given at 1155, and of these 416 reported deaths from cholera, 739 remaining unaffected by the disease. "The direction of the epidemic was north-west, and its movements very irregular as regards the villages it selected." The disease prevailed from the 1st April to 28th November, and affected nearly 36 per cent. of the total villages in the district; attacked 9009 souls, of whom 4891 died, or 54.3 per cent. of those attacked.

In Buldana district "the first case reported was that of a girl twelve years of age, in the village of Kingaon Raja, on the 19th April. It also appeared in the adjoining circle of Lonar on the same date. . . . From these circles the epidemic spread throughout the district, travelling in a north-westerly direction." Out of a total of 893 villages, 407, or 45 per cent., were affected by cholera; 13,181 persons were attacked, of whom 7414 died, or 56.2 per cent. The disease prevailed from 19th April to 23d October.

In Basim district the first report of cholera was received from the village of Moza, in the Risod circle, situated close to the borders of the Nizam's territory. "The first case occurred on the 25th April, on which date 10 attacks are recorded and 5 deaths, the latter being all amongst children of from three to four years of age. The origin of the disease is stated to have been indigenous, due to bad water; but subsequent inquiry failed to prove this statement," writes Dr. C. Little, Officiating Sanitary Commissioner.

"Almost simultaneously with the appearance of the disease in the Risod circle, it showed itself at the other end of the district, more than seventy miles distant, in three villages of the Umarkhair circle, . . . also situated along the southern boundary of the district adjoining the Nizam's territory. From here the disease travelled in a north-westerly direction, and by the end of June had invaded every circle. The disease raged furiously during June and July, and many small villages were decimated; those who escaped the disease, leaving their dead unburied, sought safety in flight." Out of a total of 888 villages, 480, or 54 per cent., were affected by cholera. Dr. Little, in his report, states that the village of Moza, where cholera first appeared in this district, is situated on the boundary separating the Nizam's dominions from Berar, and consists of about thirty-seven mud-built cabins, with a population of about 150 souls. The village was very dirty and littered with rubbish, but there were no cesspools, owing to the absence of wells. The surrounding country is bare and hilly, with trap-rock near the surface everywhere, and here and there low jungle. The water-supply of this village is from a tank situated about four or five hundred yards distant, the water of which had dried up in the hot weather, and shallow wells had been sunk in its bed; but the water was not good, and the villagers went for water to the neighbouring village of Kaputsing, in the Nizam's territory, about two miles distant, and took their cattle there daily. The disease was present at Kaputsing for twelve days before it reached Moza itself, and there was free communication between the two places. In the village of Moza, in all, there were 61 attacks and 26 deaths, 13 of which were women."

In the Akola district cholera appeared on the 22d May in a village four miles south of Akola. The village headman's report states that the disease was indigenous. On the 24th May cholera was reported from Sarvargaon rural circle, in a village half-way between Basim and Akola, and on the 31st May from the town of Khamgaon. On the 2d June the disease was reported from Khamgaon rural circle, and on the 28th June from the Balapur circle. On the 6th July the first case of cholera occurred in the town of Akola, and the disease went on spreading in the district. The last case was reported on the 15th November from the town of Akot. Out of a total of 985 villages, 330, or 33 per cent., were affected by cholera.

In the Amraoti district, exclusive of the case in February, the first appearance of cholera was on the 29th May, at the village of Mangrul, in Salod circle, and on the old road between Jalna and Nagpur. On the 1st June it appeared in the Talegam circle, in the Talegam village on the same road to the east of Mangrul, and on the 8th in the town of Karanja. On the 23d June it appeared in the Murtazapur rural circle, and on the 1st July in the town of Amraoti. After this cholera spread rapidly over the district, and at the end of the year was still active in the Amraoti town and Karanja rural circles. In this district 386 villages and 11 towns were affected with cholera. The village of Mubarakpur, in Murtazapur rural circle, suffered severely, and was inspected by the district surgeon, who reports:—

"I found a newly-formed village planted in a bog within 150 yards of the railway station. I had to walk ankle-deep in fœtid, slushy black mud in my inquiry from house to house. This village consisted of about 1500 souls, in about 80 small thatched huts, with cattle, carts, and poultry in and about the doors, streets, and houses. The effluvia was horrible."

Commenting on these reports upon the sanitary condition of the villages of Moza and Mubarakpur, the Commissioner of Berar observes—

"It may be that the dirtiness of these places was the direct and immediate cause of these sufferings; but I am afraid that the state of Moza could have been paralleled in many other villages in its neighbourhood, and I can see but little scientific interest in the fact *that when cholera was moving towards us along the whole border*, a mere administrative boundary—not a boundary marked by any physical features—it crossed at one place rather than at another. Mubarakpur is the very last village where I should have expected cholera to appear. It is a perfectly new village at a railway station; is inhabited exclusively by well-to-do merchants and railway employés; has wide, straight streets and perfect ventilation, and owing to its recent origin, the subsoil cannot be very dirty. Its only obvious defect is that it lies in a plain, the drainage of which is probably defective. It is, I think, possible to be absolutely convinced of the influence of dirt and insanitary conditions in preparing the way for cholera, and yet not to feel able to attribute its appearance in particular places to particular defects observed, or believed to have been observed, in such places. Had cholera not been raging in all the country round, its appearance in Moza and Mubarakpur would have seemed to me to deserve the closest investigation, but as the case stands, there is very little, if anything, in the case of these villages to single them out for attention.'

In the Ellichpur district cholera first appeared on the 10th July in the village of Deory. "The first case was that of a boy who was attacked whilst herding cattle in the jungles. According to the Patel's report, the origin of the disease was indigenous." On the 17th it appeared in the Chandur, Anjangaon, and East Ellichpur circles, from whence it spread gradually throughout the district, invading every circle. Out of a total of 499 villages, 110, or 22 per cent., were affected by cholera. The civil surgeon states that "only the poorer classes of the community suffered;" and the causes to which he attributes the prevalence of the disease are "bad food, excessive rain, accumulation of filth, and living in damp huts." Late in the season the Sanitary Commissioner proceeded on a tour of inspection. His inquiries into the local circumstances attending the occurrence of cholera were chiefly confined to the district of Basim, on account of its having suffered most severely from the ravages of the disease. He travelled over the greater portion of the district, and inspected a large number of villages. He reports that, as a general rule, these villages are in a most insanitary state. Their outskirts and approaches are foul-smelling and dirty, the inhabitants apparently never going far for the purposes of nature. The streets are narrow and dirty, and there is, as a rule, no attempt at surface drainage or conservancy. The houses are for the most part mere hovels, crowded together and ill-ventilated, with a cowshed attached, and a cesspit or a foul-water hole in the yard. The subsoil of these villages, he says, must necessarily be saturated with all sorts of impurities; and as the tubes of the wells are not lined with masonry, and in many instances are without parapets, the water they contain can scarcely be very pure. "Indeed, it may be safely asserted that scarcely any water is used by the village population which is fit for drinking or culinary purposes." Referring to the first appearance of cholera in the several districts, and to the spread of the epidemic over the province, Dr. Little writes, that civil surgeons in their reports attribute the origin and spread of the disease to importation; "but in no case do they show any evidence to prove their assertion that the outbreak was due to importation," or in other words, "that the resident in the locality who was first attacked had suffered in consequence of communication either direct or indirect with some individual, whether ill of cholera or in good health, who had come from an affected locality." The fact of the rapid diffusion of cholera over the province, he observes, but especially in the Basim district,

is opposed to the theory of its propagation by human intercourse; besides, it is now, he thinks, "pretty generally agreed that cholera in India is not propagated by contagion." The epidemic followed the usual course of cholera epidemics in a sudden rise and slow decline, and the high mortality may be attributed to (*a.*) insanitary state of the villages, (*b.*) an unusually unhealthy year, and (*c.*) the unfavourable condition of the people, brought about by scarcity of food and scarcity of water. The famine in Madras and Bombay drained Berar of much of its stored grain. Joari, twenty years old and upwards, was exhumed from the grain-pits, much of which was totally unfit for food, producing in those who ate it considerable bowel irritation. The poorer classes, owing to the high prices of food-grain, lived chiefly on this exhumed joari, and their health suffered in consequence. Added to this, there was a great scarcity of water over the whole province during the hot-weather months of 1878, which occasioned much distress and sickness. Thus bad food and bad water, combined with local disease causes, brought about an unfavourable condition of the people, which rendered them more liable to disease in any form, and no doubt influenced the prevalence and severity of the epidemic.

The rainfall of 1878 was exceptionally heavy, the amount measured exceeding the fall of the preceding year by nearly 15½ inches, and the average fall by 11¼ inches. So copious a fall is only once surpassed in the whole series of years dealt with, namely, in 1870, in which year the fall was 45.60 inches against 44.63 in this year; the nearest approach to so heavy falls occurred in the year 1872, in which the amount was 41.63 inches. The rainfall of 1878, besides being excessively abundant, was irregularly distributed, and fell in unduly large proportion during the last half of the year, and especially during the season of the south-west monsoon, from July to September inclusive, the third quarter of the year (see Table No. V.) The conditions which led to 1878 being a specially unhealthy year are thus summarised by Dr. Little :—

"The season of 1877 was characterised both by a scarcity of water and a scarcity of food generally. Much of the grain in the markets was unfit for human consumption, having been for years under ground, and was mouldy and foul-smelling. During the hot-weather months of 1878 the water-supply was so scanty, owing to the light rains of 1877, as to cause much privation and suffering, and the people were drinking the concentrated impurities of the wells and tanks. Garden produce was also scarce, owing to want of water for cultivation, and the mango crop entirely failed. The rains of 1878 were unusually heavy, the subsoil was saturated with moisture, and the people were exposed in an exceptional degree to the effects of damp and malaria."

Food in this year was at famine rates, the prices being but little below those ruling in the year before.

1879.—The violent epidemic of the preceding year had ceased entirely at its close, and in this year cholera did not renew epidemic activity. The disease in this year followed its normal cyclical course, and appeared only as an abating cholera, prevailing very mildly in only a few parts of the province. The death-rate of the year was only 0.10 against 15.69 in the preceding year, the total of cholera deaths registered being only 223 against 34,306 respectively. The year 1878 closed with the termination of the great cholera epidemic of that year, represented by 58 deaths in December; of these 6 occurred in Ellichpur district, and 52 in Amraoti district. The former were followed by no others in January 1879, but the latter were followed by 3 more in that month, and then cholera disappeared entirely in Berar. The province remained absolutely free of cholera during the first five

months of 1879, excepting these 3 deaths in January and a single death in May, returned also from Amraoti district. Following this reappearance of cholera in May, 11 deaths more were reported in Amraoti district during June; and the disease appeared also in Ellichpur district, with 18 deaths in the same month. In July the deaths in Amraoti increased to 34 in that month, and in Ellichpur to 67; and the disease appeared also in Akola district, where 14 deaths were registered in the same month, and no more. In August cholera entirely ceased, with 41 deaths in Amraoti and 34 in Ellichpur. These are the only cholera deaths recorded throughout the province during 1879, and they occurred mostly during the season of the south-west monsoon. Apart from the 3 deaths recorded in January in the Karanja circle as the last of the preceding year's epidemic, the first appearance of cholera in 1879 was on the 27th May, on which date the disease is reported to have broken out in the Mursi circle of Amraoti district; on the 5th June the disease appeared in the neighbouring Nandgaon and Belgaum circles, in the same district; on the 9th the disease appeared in the Dariapur circle, and on the 2d July in the Paratwara town, in the Ellichpur district; and on the 4th July it was reported in Tilhara circle, of the Akola district. The chief distribution of the disease was in Ellichpur district, which suffered least in the preceding year. The total number of towns and villages affected by the cholera of 1879 is only 39, and the total of deaths 223, the first (exclusive of the January deaths) on 27th May, and the last on 28th August.

In the Amraoti district—the January deaths excluded—the first report of cholera was from the town of Mursi, where a single case, which proved fatal, occurred on the 27th May. On the 30th a case was reported from the village of Turoda, 3 miles distant, and on the 5th June the disease appeared in two villages distant about 4 and 17 miles respectively to the south of Mursi. On the 25th June the disease appeared in Dhanaj circle, at almost the other end of the district, and about 26 miles from the previously affected circles. The last case occurred on 16th August, and in all 10 circles and 17 villages reported the disease; attacks 213, deaths 90, or 42 per cent. Regarding the first cases of cholera in this district, the following particulars are recorded:—The first and only case of cholera in the town of Mursi was that of a Muhammadan, aged 24, who was attacked on the 27th May, and died in twenty-four hours. He had returned, three days previous to his attack, from a visit to the village of Karinja, in the Central Provinces, where "cholera was not prevalent." The day following his return to Mursi, he went to Bazar Chandur, and came back the next day, and shortly after was seized with vomiting and purging.

"There was no cholera prevailing at Chandur. Deceased's house was an ordinary mud hut, with one room and a verandah, in which nine of a family lived. None of the other inmates suffered from the disease, and they were all in good health. This was one of those sporadic cases of cholera of not uncommon occurrence in an Indian village, and which cannot be attributed to any known local cause. There was nothing exceptional in the state of the village to account for this case, . . . nor could it be attributed to importation, nor to any special contamination of the water-supply."

The next case was that at the village of Turoda, where also there was a single case only.

"The village consists of some seven or eight mud cabins, situated on hard trap soil, with some surrounding scrub-jungle. Deceased was a Mahar, aged 30. He took ill on the 30th with vomiting and purging, and died on the 31st. Fifteen days previously he had been to a marriage-feast at the village of Bipur, some 18 miles distant, and

since then, up to the time of his death, had not left the village. No cholera prevailed there. No travellers had been staying in the village, nor had it been visited by any sick strangers. Water-supply from wells plentiful, and said to be good. The house in which deceased lived was a miserable hut built of cotton stalks and thatched with date leaves. Five people lived in it. They all escaped the disease. This is a similar case to the one at Mursi."

The next two cases occurred at the village of Khanapur, 4 miles from Mursi, containing about 1900 inhabitants, and situated on some rising ground in the open country, which is flat and well cultivated, with black cotton soil of considerable depth. The houses poor and crowded together, the streets narrow and dirty, and the village refuse lying about everywhere. The drinking-water is from wells; those inside the village are brackish, but there is one good well outside the village. The first case of cholera was that of a man 50 years of age. He took ill on the 31st, and died on the 1st. The house he dwelt in was a small mud cabin about 16 feet by 12, and was fairly clean. It was inhabited by six of a family, none of whom suffered. The second case, also a man over 50, was attacked similarly on the 31st, and died on the 1st. "The houses where these men lived were at opposite ends of the village, and there had been no communication between the two houses previous to the outbreak. Neither of these men had been out of the village, I was informed, for years, further than the surrounding fields. The village had not been visited by travellers or sick strangers, and I could not ascertain that any one had been to Mursi or Turoda. The disease did not spread in the village." The next appearance of cholera was in the village of Yoti, in Nandgaon circle, on 5th June.

"The village consists of a population of 1908. It is fairly clean, and there is nothing in its sanitary state differing from those surrounding it to account for the outbreak. The water-supply is from wells, many of which are brackish. On the 5th June 2 cases occurred. One died the same night. On the 12th 2 more cases were reported; . . . in all, 12 attacks and 5 deaths. The last case reported was on the 20th June, the disease having lasted fifteen days. In this village the disease was chiefly confined to the poorest, and there was nothing to show that it had been imported or could be attributed to a contaminated water-supply. The 90 cases that occurred in this district were distributed over 18 villages, and were mostly isolated cases of sporadic cholera, with no tendency to spread."

In Ellichpur district cholera appeared on the 9th June in the village of Ellichpur, in Dariapur circle, about thirty miles distant from the nearest cholera-affected village, namely, Katara, in Amraoti district. In this village there were 28 attacks and 6 deaths by cholera. It was at first reported by the civil surgeon that the disease had been imported by a party of mendicants who had visited this village some ten days previously, and where one of their number, a woman, had died. Further inquiry by the police elicited the following facts:—

A party of seven Bhandaris came to the village of Ellichpur, and encamped outside the village. One of their number, a woman of about 15 or 16 years of age, was ill with fever and ague, from which she had been suffering for about a month. The Patel of the village, seeing that the woman was very ill, allowed her to stop in his cowshed, where she died the following morning about 8 A.M. About 5 P.M. the previous evening she had been purged once, but had no further purging or vomiting. The people came from Súkali, a village in the Akot circle of Akola district. They first went to Ellichpur town, *via* Akot and Anjangaon, where they stopped a fortnight; from Ellichpur they went to Uprai, and remained there ten days; from Uprai they proceeded to Nandede, remained a fortnight, and then to Ellichpur village, where the woman died. She first took ill at Ellichpur town, and was ill continuously up to the time of her death. None of the villages or towns through which they passed suffered from cholera, either previous or

subsequent to their visit, nor did any of the party take ill. On leaving Ellichpur these people returned to Súkalí; no cholera appeared along the route they took, nor in their own village.

The disease next appeared on the 11th June at a neighbouring village, where there were 6 attacks and 4 deaths; and on the 2d July at Paratwara, at the other end of the district, where there were 2 attacks and no deaths. In all, cholera was reported from 6 circles and 13 villages; attacks, 309; deaths, 119.

In Akola district cholera was confined to two circles only, namely, Tilhara and Dahyanda; in the first 5 villages were affected, and 30 attacks and 11 deaths reported; in the other only 1 village was affected, and there were 5 attacks and 3 deaths—total, 14—all in July. The first case occurred in a boy, aged 10 years, resident of Tilhara, who took ill on 4th July whilst working in the fields; the next day a woman, aged 30, was attacked; both recovered. On the 9th July 1 fatal case occurred, and 2 on the 12th. "All these cases were amongst the poorest in the village." Tilhara is a group of some five villages, situated together, 30 miles from Akola, and with a population of about 3000 inhabitants; soil alluvial, houses chiefly mud huts, streets and back-yards of houses filthy; heaps of manure and other refuse lying about outskirts, and sides of streets defiled with excrement; no waste land near the village, the surrounding country being all under cultivation up to the village walls; water-supply from wells, and brackish. The above details are the results of personal inquiry on the spot by the Sanitary Commissioner.

The rainfall of the year 1879, though much less than the exceptionally heavy fall of the preceding year, was still some $3\frac{1}{2}$ inches in excess of the average. It was also more seasonably distributed than the fall in the year before, with unusually plentiful fall in the second quarter.

There was a marked improvement in the prices of the staple food-grain, but rates still held very high.

1880.—In this year, the third of the cycle 1878–80, cholera sank into absolute abeyance. A single death reported in the Buldana district is the only record of cholera throughout 1880 in the Berar Province. The season was unusually hot and dry as compared with the two previous years, owing to deficiency of rainfall, which produced more or less severe drought during the first nine months of the year.

The rainfall of 1880 was only 23.66 inches, or about 10 inches below the average; the defect occurred in the first three quarters, the fall in the last being copious. No such great defect has been recorded in any previous year of our series, except in 1866, in which year the fall, 23.15 inches, was about equal to that of this year, and in 1871, in which the fall, 20.64 inches, surpassed in deficiency that of 1880. The seasonal distribution of the rainfall in these several years, however, differed very materially (see Table No. V.) The price of food in 1880, owing to the good harvests of the two preceding years and the re-stocking of the grain-stores of the country, was exceptionally cheap—cheaper than in any other year of our series. The average price of the staple food-grain fell to 36.40 sers the rupee from 18.40 sers in the year before.

1881.—In this year, the first of a new triennial cycle, cholera again renewed epidemic activity. The death-rate for the year is 1.56 per mille of population, and the total number of cholera deaths registered, 3404. The epidemic of 1881 commenced its course in the very middle of the year. During the first six months there was no sign of the presence of the disease

in any part of the province, save a single death recorded towards the end of June in the Akola district. In July cholera broke out with considerable epidemic force in the Akola and Buldana districts, and commenced with some activity in those of Amraoti and Basim also. In August the disease was in active progress in all the districts of the province, and in this month attained its maximum intensity. During September the epidemic continued at maximum intensity, but in October the disease suddenly abated, and the mortality in that month fell to the level of the mortality at the commencement of the epidemic in July. During November the disease continued to abate, but the year closed with a tendency towards increased activity in December.

The first report of cholera in this year was received, it is recorded, on the 25th June, from Khamgaon, in Akola district. "A Eurasian traveller, who had come from Bhosawal, where cholera was prevailing, was taken ill three hours after his arrival, and died of the disease." The medical officer who was in attendance on the case "reported it as one of genuine cholera. There was no other case as a sequence to this one; neither was it apparently connected with the outbreak of the epidemic some fourteen days afterwards which occurred in the village of Anthree, in the Buldana district, about 36 miles distant to the south-west." The first case that occurred in the village of Anthree, it is stated, was that of a boy aged 5 years, who was taken ill on the night of the 7th July, and died on the morning of the 9th. The next was that of a woman living next door, who was attacked on the 9th, and died on the 10th. The third case was that of a woman, aged 60, who lived at the opposite end of the village, and who also died. The disease then spread throughout the village, and prevailed up to the 19th August, on which date the last attack occurred. Altogether, out of a population of about 170 in this village, there were 69 attacks and 33 deaths from cholera. The civil surgeon personally inquired into this outbreak, and reported that "the first case was plainly indigenous, and was the first attack in the district. No person affected with the disease had come to the village, nor had the people of the village gone to any place where the disease was prevailing." The village was in a filthy condition at the time of the outbreak, and its sanitary state was bad. "There had been four deaths from fever the previous month, but the general health of the village was good."

The next report of epidemic cholera was from the village of Ambikapur, 11 miles from Khamgaon, on the 11th July. The disease prevailed here from that date to the week ending 5th August, and out of a population of 991 there were 25 attacks and 5 deaths. The civil surgeon "considered this outbreak derived from a wandering tribe proceeding from Khandesh to Basim, a woman of the party having died the day previously with symptoms of cholera." As the civil surgeon had "further reported to the civil authorities that these people were spreading the disease throughout the district, and recommended that they should be placed in quarantine, the Sanitary Commissioner had them followed up, and obtained from the district superintendent of police a detailed account of their movements from the time they started on their wandering tour from their houses in the village of Loharra, in the Murtazapur circle of the Amraoti district, until their return back to that village. From this account it appears that the party consisted of 8 men, 7 women, 6 boys, and 2 girls before they were attacked with cholera. After visiting two villages in the Buldana district, they went on by two others to Jejoree, in the Poona district; thence, visiting three other villages, they came to Dhulia, in the Khandesh district; from this they went to Maligam, and

thence, visiting two other villages, they entered Berar, and came to Khamgaon from Nandura. They stated that cholera was not prevalent amongst the people and villages through which they passed. "But this," says the police officer, "is a mistake; for cholera was, and had been for some time, bad in Khandesh when they passed through." The party arrived at Khamgaon all well on the 8th July, and on the following day the first case of cholera occurred among them in that town. The person attacked was a woman, aged 40, and she died. The next case was that of a man, who was taken ill at Khamgaon, but was carried to Ambikapur, where he died on the 12th July. On this last date the third and last case among this party occurred; it was that of a boy, who was taken ill at Ambikapur, and recovered. Altogether the party had three attacks and two deaths from cholera. The party arrived at Khamgaon on the 8th July, and stayed there two days. They encamped in the market-place at Khamgaon, and in the pursuit of their profession used to go into the town begging from house to house. They used to drink river-water. No communication was held by any of the people of Khamgaon with those sick of the disease among them. On leaving Khamgaon they passed through four villages to Ambikapur, at which they halted. From this they went through three other villages to Piapulgaon, where they again halted; then on through two other villages to Kapsi, where they halted; and again through two others to a halt at Rediwa; then through two others to a halt at Pimgar; and finally through two others to their homes in Loharra, whence they had set out on their begging tour. The party made no halt on the other side of Khamgaon whilst in the Akola district; they came into Khamgaon straight from Nandura, in the Buldana district. They could not account for the appearance of the disease amongst them. The first attack came on suddenly in Khamgaon itself. They were nine days in travelling through the district, and cholera did not break out in any village along their line of march for more than a month afterwards.

From the above particulars it appears that this party had travelled through the affected district of Khandesh before they entered Berar; that they last came from Nandura, in the Buldana district, to Khamgaon, in the Akola district, on the 8th July; and that at the latter place—although, as it is stated, there was no cholera at Nandura until the 31st July—one of their number was attacked with cholera on the 9th, and died on the 10th, whilst another was also taken ill during their two days' stay at Khamgaon, but was carried on to Ambikapur, eleven miles distant, where he died on the 12th July. The medical officer who saw the first of these two cases reported that it was not cholera. However, at Ambikapur, as above mentioned, there was a third case, and this recovered. These were the only three cases among this party—"a result which," as Dr. Little observes, "it might be suggested, was due to their having moved away from the locality affected by cholera."

We thus have the first case of cholera reported at Khamgaon on the 25th June, and the next on the 9th July, and the first case at Ambikapur on the 12th July. The next reports of the appearance of the disease are at Hingna Kazi village on the latter date, and at the town of Malkapur on the 14th July. "These places are situated close to each other in the Buldana district, about 42 miles from Ambikapur, the nearest infected locality. Outbreaks also occurred almost simultaneously in the surrounding villages." Malkapur is situated on the line of rail; and the civil surgeon reports that there had "been daily communication between Bhosawal, where cholera was prevailing more than a month by report, and Malkapur;" but, as Dr. Little

observes, the earliest cases in Malkapur clearly occurred in people who had no communication with Bhosawal, or with affected persons from that place.

Following this, cholera appeared in epidemic form in Khamgaon on the 18th July, no case having been reported here since those of the 25th June and 9th July before mentioned, and after this the epidemic became rife throughout the districts of Akola and Buldana. In Amraoti district the first case reported was on the 20th July at the village of Bagi, 7 miles from the Chandur railway station, in the Talegaon circle. It was that of a Bannia, who had on that date returned to his home in that village from a visit to the Pandarpur Fair, in the Poona district of the Bombay Province. He had travelled by railway through a locality in which cholera was prevailing, was taken ill immediately after his arrival at the village, and died the following day. On the day after his death a woman was attacked with the disease, and died in a few hours; and three others were attacked in the same house with this woman, but recovered. The disease then spread rapidly in the village. From the 23d July to the 3d August there were reported 74 cases and 14 deaths, out of a population of about 525. The next appearance of cholera in this district was in the village of Virul, 11 miles from Bagi, on the 6th August. On that date two cases occurred, both of which proved fatal. The first was that of a boy aged about 17 years, who took suddenly ill with purging and vomiting, and died in ten hours. These were the only cases in this village, and no communication could be traced between those affected and the people of Bagi, although some of the people of Bagi, it appears, attended the Virul weekly market the day preceding the occurrence of these two cases. After this the disease appeared here and there in different parts of the district. Altogether 56 villages were affected out of a total of 796 in the district, and collectively they returned 380 deaths from cholera.

In the Basim district, which was the next in order affected, cholera appeared on the 23d July in the Gohogaon village, about 8 miles distant from Maikhar, in the Buldana district, where the disease had appeared on the 19th July. There were altogether 25 attacks and 6 deaths from cholera in this village. On the 30th the disease appeared at Risod, the headquarters of the circle, and after that date spread through the district. Out of a total of 880 villages, 62 were affected; total deaths, 427.

In the Wún district the first case of cholera was reported on the 7th August from the village of Saoji, in the Nandura circle. On the following day the disease broke out in Babulgaon, and on the 13th in the village of Yeotmal itself. In each of these instances the disease was supposed to have been imported. In the instance of Saoji, it is stated that "a man coming from Bagi put up in the house of a Kambi, to whom he communicated the disease, though not suffering from it himself." In the instance of Babulgaon, it is stated, "a party of travellers passing through from Bagi on the 5th were supposed to have conveyed the disease." As before mentioned, cholera had appeared at Bagi on the 20th July, and prevailed there up to the 3d August; but the disease continued active in the Talegaon circle, in which Bagi is situated, until the 7th November, on which date the last cholera death was registered. By this time 25 out of the 101 villages in the circle had been affected. In the instance of Yeotmal, it is stated that "the first case attacked was that of a man who had been to Babulgaon market on the 10th, remained there two days, returned to Yeotmal on the 12th, and was attacked with cholera on the following day. The disease then spread here and there throughout the district." Altogether, out of a total

of 773 villages in this district, 62 recorded cholera, and the total deaths were 309.

In Ellichpur district cholera was first reported on the 12th August from Dariapur. "The first case was that of a lad 18 years of age, who was attacked the night of the 11th, and died the following morning. A second case, in a man of 70 years of age, occurred on the same day, and also proved fatal. No communication could be traced between these cases and any infected locality or persons, but cholera was at the time travelling in this direction from the Akola district."

From the foregoing account it appears that in 36 days from the first appearance of cholera in an epidemic form at Anthree, in Buldana district, on the 7th July, each district of the province had become affected by the disease.

In the Akola district the highest number of deaths registered in any one locality was in the town of Akola—population, 14,606—where the mortality reached 162, or 9.7 per mille of the population. "The first case was that of an old woman, who was attacked some time after midnight on the morning of the 26th July." Her nephew had been to Khamgaon on the 18th, stayed there one night, and returned to Akola on the 19th; and "he was supposed to have communicated the disease to his aunt, though not suffering from it himself." But a second case occurred about the same time. "In the early morning of the 26th a Pardesi, vendor of atta and dall (wheat-meal and lentils), living in the same locality, was attacked." No communication could be traced between these two cases, "though it was suggested that some one from the house of the first case might have gone to make purchases at the shop of the second." On the same day, however, a third case also occurred. A girl, aged 5 years, was attacked about 11 P.M. of the 26th, and died the following day. No other particulars are given regarding this case. The fourth case occurred on the 27th, in a Brahmin, aged 50 years, "who had been in bad health previously." He took ill at 9 A.M., and died about 9 P.M. "There had been no communication between this and any of the previous cases." The next place in the order of fatality in this district was the town of Khamgaon—population, 8472—where 313 attacks and 98 deaths were reported. "It appears that immediately preceding the advent of cholera there had been an unusually large number of cases of diarrhœa, colic, and indigestion treated at the dispensary." The first suspicious case occurred among the wandering party previously referred to. The woman was taken ill with purging and vomiting at 6 A.M. on the 9th July, and died on the following day; but the case was not at the time recorded as cholera, "as there was an absence of other choleraic symptoms." Nine days after the occurrence of this first case, however, cholera broke out simultaneously, on the 18th July, in five different quarters of the town, and quickly spread. It lasted in all 54 days.

The heaviest death-rate in the province occurred in the Buldana district, where it was 2.80 per mille of population. The total of attacks reported was 2824, and of deaths 1229, or at the rate of 43.5 per cent. of attacks. The disease appears to have spread into this district from the adjoining districts of the Bombay Province, and appeared first in Andera circle on the 7th July, then in Malkapur circle on the 12th, and in the Maikhar circle on the 19th. These three circles alone, out of the sixteen affected in the district, together contributed more than half of the registered mortality, and some of their villages suffered very severely. Thus in Mera the death-rate was 28.20 per mille of population, in Maikhar it was 8.40, and in Malkapur 8.20.

In the Wún district cholera did not appear until the 7th August, and in

the Ellichpur district not until the 11th. In both districts the disease ran a mild epidemic course, and ceased in November; but in the Wún district there was a revival of the disease in December, and it continued to prevail until the 21st January following, when it finally ceased. During November no cholera had been recorded in this district. The reappearance of the disease in December was investigated by the medical officer. He described it "as being circumscribed to a valley with a radius of about 12 miles, surrounded by wooded hills." The disease manifested itself almost simultaneously at extreme points in the length of the affected area, in the villages of Kalgaon and Mandwa, on the 4th and 5th December respectively. The first cases at Kalgaon were those of two male infants, who died in a few hours after being attacked. The mother of these children took the disease the next day, and also died of it. No other cases occurred here for a fortnight, and then three more cropped up. The last case occurred on the 4th January 1882, up to which date there had been altogether 9 attacks and 7 deaths out of a population of 1309. Regarding the sanitary state of this village, the medical officer reports:—"I describe its condition accurately by calling it about the filthiest spot in the Yeotmal district. There was enough of sweepings and ordure, both human and animal, in the village when I visited it to produce running streams of filth in the first heavy shower of rain." At Mandwa—population about 625—distant 12 miles from Kalgaon, the first case occurred on the 5th December, "in the person of a woman who, it was stated, had recently returned from some infected locality in the Basim district; but the exact dates of her leaving the infected place and arriving at Mandwa could not be ascertained." This case proved fatal in about sixteen hours; and two days afterwards the disease became pretty general up to the 14th December, when the last case occurred. Altogether, 23 attacks and 12 deaths were reported in this village.

The principal points of interest in the history of the cholera epidemic of 1881 in the Berar Province, as noted by Dr. Little, may be briefly stated as follows:—

(*a.*) The prevalence of cholera in the adjoining district of Khandesh, lying to the west of Berar, for some time previous to its extension into and progress through Berar, "in an easterly direction, as though influenced by the south-west monsoon."

(*b.*) The prevalence of bowel complaints—as shown by the dispensary statistics of Khamgaon—for some time before cholera broke out in this province.

(*c.*) The fact that the disease did not spread from one centre, the first cases in almost every district occurring in villages at a distance from large centres of population and main lines of communications; whilst the diffusion of the disease throughout the province was rapid—Buldana becoming affected on the 7th July, Akola on the 11th, Amraoti on the 20th, Basim on the 23d, Wún on the 7th August, and Ellichpur on the 11th. Thus the whole province was covered in the space of thirty-six days.

(*d.*) The epidemic of 1881, contrasted with that of 1878, when the mortality from cholera alone reached 15.60 per mille of population, presents the following points of difference. The cholera of 1881 never became localised in such intensity as that of 1878, when the mortality in Basim rose to 42 per mille of population. In 1878 the public health was bad, the famine having just touched Berar, while in 1881 the general health had been fortified by two years of plentiful harvests and cheap prices.

The rainfall in 1881 was abundant and fairly distributed over the

seasons. It exceeded the average by upwards of 4 inches, and the very defective fall of the preceding year by nearly 14 inches. Food was also abundant and unusually cheap in 1881, the cheapness of the staple food-grain being surpassed by the rates holding only in the years 1880 and 1875 out of the whole series from 1862.

Summary Review.—Looking through the series of years for which we have statistics of the disease, it appears that cholera, in respect to the periods of its epidemic outbreak and subsidence in the Berar Province, pursued a very similar course in each of the years 1868, 1870, 1871, 1872, and 1881. In each of these years the disease started afresh into a new epidemic course in the month of June, and continued in full activity during the following months until the end of September, after which it rapidly abated during October, and finally, with unimportant fluctuations, subsided more or less entirely by the close of the year; the province remaining, to a greater or less extent, absolutely without sign of the presence of the disease during the first half of the year. In the years 1873 and 1874, and again in 1880, the province, partaking of the general immunity from cholera which characterised these years in Southern India, presents an absolute absence of the disease. In the years 1875 to 1879 inclusive, cholera commenced its epidemic activity somewhat earlier in the year, generally in May, though in 1878 the epidemic broke out in April, and in 1877 the disease appeared as early as March. In 1869 there appears to have been a double epidemic of cholera, the first prevailing at highest intensity during April and May, and the second during July and August, as in the other years of the series. This double epidemic was caused by a sudden check and abatement of the disease during June in the progress of the epidemic towards its culminating point in July.

In every year of the series onwards from 1868, in which year the registration of deaths was first commenced in this province, epidemic cholera abated, more or less distinctly, in the month of October, and continuing to decline to the close of the year, ceased entirely in the cold weather. It thus appears that in the Berar Province the commencement and subsidence of epidemic cholera is coincident with and contemporaneous with the season of the south-west monsoon; and, as is remarked by Dr. C. Little in his Sanitary Administration Report for 1881 (p. 11)—"The rule appears to be that cholera increases with the first rainfall, but as the rain becomes heavier and more continuous the disease begins to abate, and dies out in the cold weather" (see Table No. II.) In the Berar Province, as the statistics show, epidemic cholera is a disease experienced only in the season of the hot-weather or south-west monsoon; and the months of its maximum prevalence are July and August.

A reference to Table No. V. shows very clearly, and with more regularity than is found to have obtained in the two provinces already disposed of, the cyclical periodicity of epidemic cholera revival, abatement, and subsidence in the successive years of each triennial period, to which attention has been drawn in previous passages. For the first triennial cycle, 1863–65, we have no statistics; for the second, 1866–68, statistics for the last year of the period only are available; but for the succeeding four triennial cycles, comprised in the years 1869 to 1880 inclusive, we have complete statistics. In each of the successive cycles, 1869–71, 1872–74, 1875–77, and 1878–80, the epidemic revival in the first year of the triennial period is very distinctly marked; the subsequent course of cholera in the next two years of each cycle is also very distinctly marked, and with proportionate variations in respect to the rapidity of abate-

ment and completeness of subsidence. In the case of each cycle, it appears that the epidemic revival of cholera was consequent on a defective rainfall and drought in the last year of the preceding cycle, and attendant on abundant rainfall and humidity in the year of its revival. It further appears that in each year of the revived epidemic of cholera the condition of the people was more or less unfavourably affected by the food-supply, which in every instance, except that of 1875, was very scarce, the prices touching, if not actually reaching, famine rates. All this is in remarkable correspondence with what, as we have seen, has been found to obtain in this connection in the other two provinces already discussed.

SECTION V.

CENTRAL PROVINCES.

Geographical Position.

THE Central Provinces comprise the territory lying between 17° 50′ and 24° 27′ N. lat., and between 76° and 85° 15′ E. long., and are nearly coincident with the old geographical division of Gondwana. The divisions, districts, area, and population are shown in the annexed tabular statement.

STATEMENT *showing Population, Area, and Density of Population in each District of the Central Provinces for the year* 1872.

Divisions.	Districts.	Population (Census 1872). Males.	Females.	Total.	Grand Totals of Divisions.	Area in square miles. District.	Division.	Population per square mile. District.	Division.
Vindhya.	Saugor . . .	278,351	249,374	527,725	979,566	4,005	8,769	131·77	111·70
	Damoh . . .	139,962	129,680	269,642		2,799		96·34	
	Murwara . .	91,189	91,010	182,199		1,965		92·72	
Nerbudda.	Jubbulpore. .	179,048	167,612	346,660	1,273,585	1,953	10,427	177·50	122·14
	Narsinghpur .	176,552	162,843	339,395		1,916		177·14	
	Hoshangabad .	234,195	208,991	440,186		4,222		104·26	
	Nimar . . .	78,906	68,438	147,344		2,336		63·08	
Tapti.	Burhanpur. .	33,534	30,298	63,832	63,832	1,004	1,004	63·58	63·58
Satpura.	Mandla . . .	110,473	102,545	213,018	1,364,021	4,719	18,316	45·14	74·47
	Betul. . . .	144,606	139,449	284,055		4,118		68·98	
	Chhindwara .	132,962	131,648	264,610		3,265		81·04	
	Seoni. . . .	162,702	158,921	321,623		3,072		104·69	
	Balaghat . .	139,430	141,285	280,715		3,142		89·34	
Wainganga.	Bhandara . .	279,284	285,529	564,813	2,008,778	3,922	16,787	144·01	119·65
	Nagpur . . .	321,440	309,669	631,109		3,734		169·02	
	Wardha. . .	180,899	173,821	354,720		2,379		149·10	
	Chanda . . .	202,021	203,995	406,016		4,781		85·00	
	Upper Godavari	27,273	24,847	52,120		1,971		26·44	
Mahanadi.	Raipur . . .	456,660	460,652	917,312	1,736,822	7,092	11,130	129·34	156·04
	Bilaspur . .	250,779	248,769	499,548		2,677		186·60	
	Sambalpur . .	159,761	160,201	319,962		1,361		235·09	
Total of the provinces		3,777,027	3,649,577	7,426,604		66,433		111·79	

Besides the territory under British administration, there are sixteen Native States included in the Central Provinces. Their aggregate area is 28,834 square miles, with an estimated population (in 1872) of 1,049,710 persons. Of these Native States, that of Chutia Nagpur is the most extensive and important.

CENTRAL PROVINCES.
SHOWING DISTRICTS.
BUNDELKHUND
CENTRAL INDIA
REWAH
CHOTA NAGPUR
ORISSA
BOMBAY PROVINCE
BERAR
NIZAM'S DOMINIONS
ZAMINDARIES
JEYPUR
SAUGOR
DAMOH
HOSHANGABAD
BETUL
CHHINDWARA
SEONI
NARSINGHPUR
JUBBULPORE
MANDLA
BALAGHAT
BILASPUR
SAMBALPUR
RATNPUR
BHANDARA
NAGPUR
WARDHA
CHANDA
SIRONCHA
Zamindary
NIMAR
BURHANPUR
Vincent Brooks, Day & Son, Lith.
Trübner & Co. London.

Physical Aspects.

The tract falls naturally into several distinct areas, marked out by their physical features, and in a great measure by geological structure. To the north extends the Vindhyan tableland (including the districts of Saugor and Damoh), which sheds its waters northwards into the valley of the Ganges. Throughout this region the surface is formed by the *Vindhyan* deposits, except in the large tracts where the Vindhyan strata are concealed by the overflowing volcanic rocks of the great Deccan trap area. South of Saugor and Damoh, in the valley of the Nerbudda, come Mandla (which includes the upper course of the river before it debouches into the plains), Jubbulpore, Narsinghpur, Hoshangabad, and a part of Nimar, the rest of which lies in the valley of the Tapti. This area chiefly consists of alluvial and tertiary deposits, with a narrow belt of older rocks along the southern side of the valley. Continuing southwards, the next cluster of districts comprises Betul, Chhindwara, Seoni, and Balaghat, which occupy the extensive highlands constituting the Satpura tableland, in great part formed of the Deccan traps, resting upon crystalline rocks, or upon sandstone and other rocks of later date. These districts at their central plateaux attain a height of about 2000 feet. Still farther to the south extends the great Nagpur plain, formed by the valleys of the Wardha and Wainganga, which comprises the districts of Nagpur, Wardha, Bhandara, and Chanda. This region has no great elevation. It rests principally on gneissose and trap rocks, the former predominating in Nagpur and Bhandara, the latter in Wardha, eastwards. Below the Ghats lies the Chhatisgarh plain, a low expanse of red soil, containing the districts of Raipur and Bilaspur. In this division is also included the district of Sambalpur, a rugged and jungly country, composed of crystalline and metamorphic rocks; this district is not a part of Chhatisgarh, either geographically or historically; it lies principally in the valley of the Mahanadi. Last of all, to the extreme south, almost cut off by forests and wild semi-independent states, is the Upper Godavari district, a strip of territory of varied geological structure, stretching along the left bank of the Godavari.

Thus a hill plateau is succeeded by a lowland plain, and again a larger and loftier plateau by a larger plain, ending in a mass of hill and forest, which is probably the wildest part of the whole Indian peninsula. But even the comparatively level portions of this area are broken by isolated peaks and straggling hill-ranges; and nowhere in India are the changes of soil and vegetation more rapid and marked than in the Nerbudda country. The Satpura plateau, stretching east and west for nearly 600 miles, with the wheat-fields of the Nerbudda valley on the one hand and the rice-lands of the Nagpur plain on the other, forms the true barrier between Northern and Southern India, and constitutes the country of Gondwana, the retreat of the aboriginal Gond people. (Hunter's *Imperial Gazetteer.*)

The Native States included in the Central Provinces are very sparsely populated, and some of them intervene between the British districts, chiefly in the eastern division and in Chanda, and thus interfere with the general registration of vital statistics in the provinces. There are also considerable tracts of hill and forest in Hoshangabad, Nimar, and Chhindwara which are not reached by registration. Of the whole area of the provinces, little more than one-fourth is under cultivation; the remainder is barren rock, waste, and forest. The population is generally very sparse.

The Central Provinces, within the limits above defined, present a great variety of physical aspects and climate. Their extreme length from north to south is 500 miles, and their breadth from east to west 600 miles. To the east the provinces extend to within 100 miles of the Bay of Bengal; to the west they are bounded by Khandesh and Malwa, which separate them from the Gulf of Cambay; to the north by the Independent States of Bandelkhand and by Bhopal; and to the south by the Nizam's dominions and the Madras Province.

The province contains rich valleys and wide fertile plains, but, taking it as a whole, it is a mountainous country. Some districts lie wholly among hills, and the surface of even the most open districts of the plains is more or less broken by low ranges and isolated hills. The most prominent hill-range is the Satpura, which, commencing at the lofty plateau of Amarkantak, extends westwards as far as the western coast. From Amarkantak an outer ridge runs south-west for about 100 miles to the Saletakri Hills, in the Balaghat district, thus forming, as it were, the head of the range, which, narrowing as it proceeds westward from a broad tableland to two parallel ridges bounding on either side the valley of the Tapti, ends, so far as this province is concerned, at the famous hill-fortress of Asirgarh; beyond this point the Raj Pipla Hills, which separate the valley of the Nerbudda from that of the Tapti, complete the chain as far as the Western Ghats. The mean elevation of the range is about 2500 feet above the level of

the sea, but many of the peaks and some of the tablelands have an elevation of more than 3500 feet. The plateaux of Amarkantak and Chauradádar, in the Mandla district, rise to a height of nearly 3500 feet; the height of the Khamla Hill, in the Betul district, is 3700 feet; and the general height of the Chikalda Hills, overlooking the Berar plain, is estimated at 3700 feet; and the Pachmarhi Hills, rising abruptly from the Nerbudda valley, culminate in Dhápgarh at an elevation of 4500 feet.

Just east of Asirgarh there is a break in the range, through which the railway from Bombay to Jubbulpore and the road to Central India passes, at which the elevation is not more than 1240 feet above the sea. West of Asirgarh the range is continued through Khandesh to the Western Ghats by a belt of mountainous country 40 to 50 miles in breadth, at an average height at the crest of the chain but a little under 2000 feet above the sea, while many peaks rise above 3000 feet, and some as high as 4000 feet. The whole length of the range is scarcely less than 600 miles, while the breadth diminishes from 100 miles at its head across Balaghat and Mandla to the narrow ridges of Nimar. On the tablelands of this range east of Asirgarh lie the districts of Betul, Chhindwara, Seoni, Balaghat, and Mandla. Low hills, offshoots of the Satpuras, forming the south-eastern boundary of Jubbulpore district, stretch northward and approach the Kaimur Hills, which, with the Bhanter Hills—both branches of the Vindhyan range—bound Jubbulpore to the north and west, and form the eastern scarp of the plateau, on which lie the districts of Saugor and Damoh. These ranges attain a height of 2500 feet.

Extending eastward from Amarkantak to within a few miles of the eastern coast, a succession of ranges of mountains, which are offshoots of the Vindhyan chain, separate the Sambalpur plain from Chhota (Chutia) Nagpur. To the south the province is shut in by the wide mountainous tract of the Native State of Bastar, which stretches from the Bay of Bengal to the Godavari, and west of that river is continued onward to the rocky ridges and plateaux of Khandesh by a succession of ranges that enclose the plain of Berar along its southern border.

The plain-country of the province may be said to lie in two great divisions to the north and south of the great central range of mountains. North of the Satpuras we have the rich valley of the Nerbudda, which may be said to commence towards the north of the Jubbulpore district, and to extend through the district of Narsingpur as far as the western limit of Hoshangabad, a distance of nearly 300 miles. The elevation of the valley above the sea falls from 1400 feet at Jubbulpore to 1120 at Hoshangabad. In breadth it is about 30 miles, extending between the Satpuras and the southern scarp of the Vindhyas. This great plain, 12,500 square miles in extent, contains for the most part land of the greatest fertility, cultivated with wheat, cotton, and sugar-cane. The continuation of the valley west of Hoshangabad forms the northern portion of the district of Nimar. Towards the river, though rich in parts, the tract of country is wild and desolate, but nearer the base of the hill-range the country forms itself into a large natural basin of fertile land, which is highly cultivated.

South of the Satpuras and of the ranges that run eastwards towards the Bay of Bengal and complete the central chain of mountains, we have first, beginning from the east, Sambalpur, which, with all its Native States and Zamindaris, extends over an area of 23,000 square miles, and may be considered the central basin of the Mahanadi. Separated from Sambalpur by ranges of hills running southwards from the central chain, lies the great plain of Chhatisgarh, at a mean elevation above the sea of 1000 feet. It has an area of 22,000 square miles, and forms the upper basin of the Mahanadi. Farther to the west, and again divided off by hills, is the great plain of Nagpur, extending over 21,000 square miles. Its general surface inclines towards the south from 1000 feet above the sea at Nagpur to 750 feet at Chanda; subdivided by a low line of hills, its eastern division is drained by the Wainganga, the western by the Wardha. Continuous with the western portion of the Nagpur plain is the great plain of Berar, lying between the Satpuras on the north and the Ajanta range on the south. It extends for 200 miles from the Wardha River to Khandesh. The general slope of the plain is to the westward, gradually falling from 1000 feet above the sea at Badnera to 700 at Bhosawal.

The composition of the soils of the different tracts of country has an intimate connection with the nature of the prevailing rock or deposit. In the Nerbudda valley we have a rich alluvial soil throughout its cultivable area, varying, however, with the rocks which form the hills, from which the mountain streams that intersect it in all directions take their rise. Thus in the upper part of the Narsingpur district, where the formation of the neighbouring hills is trappean, the soil of the valley contains a larger proportion of true black soil, while lower down the valley, where the hills that bound it on the south are of sandstone, the soil is more largely mixed with sand. This valley is perhaps the most fertile tract in the province, and in the cold weather from many points presents a vast sheet of wheat extending as far as the eye can reach.

The plateaux and valleys of the Satpura range, where not denuded, are covered with the true black soil, formed from the decomposition of trap, a soil that is highly retentive of moisture, and, where it exists in sufficient depth, produces the finest wheat; while the uplands, where the soil is shallow, are cultivated only in the rains, and then only in patches with the small millets, kodo (*Panicum frumentaceum*) and kutki (*Panicum miliaceum*), the rest of their expanse remaining covered with coarse grass, which springs up in the rains, to wither and become brown as soon as the dry winds of the autumn set in. This serves as fodder for the large herds of cattle which are kept in every hill village; but as the hot weather approaches, the residue is everywhere set on fire, to make way for the herbage of the ensuing rains. The soil of the Sambalpur plain is light and sandy, cultivable only in the rainy season, when it produces a plentiful crop of rice. In the Chhatisgarh plain its north-western portion is covered with rich black soil, but in the central and eastern portions the soil is light and porous, and cultivation is only practicable during the period of almost constant rain, and rice forms the staple crop. In the eastern portion of the Nagpur plain the formation consists chiefly of crystalline rocks, in the Chanda district of porous coal-bearing strata, and in the Wardha valley, where the overflowing trap is the superficial rock, of true black soil.

The slopes on both sides of the Satpura range are covered with dense forest, and wide tracts of forest occur in the plain country south of the range; in fact, there is not a district of the province which has not many thousands of its acres covered by jungle and forest. On the other hand, in many parts of the province, the absence of trees forms a characteristic feature of the scenery, as on the whole central area of the Chhatisgarh plain, the uplands of the Satpuras, over a great part of the Wardha valley, and along the whole length of the Berar plain, where there is often scarcely a tree to be seen for miles.

The principal rivers which, with their tributaries, drain the wide region of the Central Provinces are the Nerbudda, the Mahanadi, the Wainganga, and the Wardha. All these rivers receive the drainage of immense areas, and flow for several hundreds of miles, rapidly draining the country. They are navigable for long distances during the rains, but the sources from which they rise and the greater part of their catchment-basins lie at a great elevation above the sea. The surface of a great part of the country through which they flow is rocky, and the fall towards the sea rapid, and they all flow in deep beds many feet below the level of the country which they drain. The drainage of the country, therefore, is very rapid, and as ordinarily no rain sufficient to affect the water-supply of the country falls between the cessation of one rainy season and the commencement of another, the streams annually run very low; even the large rivers above mentioned become everywhere fordable, the rivers of second magnitude are reduced to rivulets flowing in the middle of broad beds of sand or trickling over masses of rock, while all the minor streams dry up or contain only pools of stagnant water.

The variation of the subsoil water in some localities is very remarkable. At Raipur, from only 1½ feet from the surface in September, it falls to 36 feet in May; at Sambalpur, from 3 feet to 32 feet; at Saugor and Chhindwara, from 16 to 38½. This indicates a very rapid draining of the soil. There is not, it is believed, a marsh of any extent of natural formation in the whole province. From the rise and fall in the level of the subsoil water measured in the jail wells of seventeen out of nineteen districts of the province, it was found that, excepting in the very porous strata of Raipur and Chanda, the level of the subsoil water was but little affected by the rains before the end of July; that, generally speaking, it reached its highest level in the end of September; that with the cessation of the rains it immediately commenced to fall, and the fall was continuous till the end of May. To counteract the effects of this too rapid drainage, and retain water for the use of men and cattle in the hot weather, and for the irrigation of the crops when the rains have fallen short, artificial means are adopted. In the Nerbudda valley the streams are dammed back every year when they begin to run low. In the plains of Sambalpur and Chhatisgarh tanks of various sizes are formed by excavations of the surface, or by running embankments across the trough of the undulation of the plain; while in the hilly parts of Bhandara and Chanda large lakes are formed by blocking up the outlets of the valleys. (Dr. S. C. Townsend's Sanitary Administration Report for 1869.)

Cholera History: Statistical and Descriptive.

The annexed tabular statements, Nos. I. to VI., corresponding in details with the similar statements given with the other provinces, exhibit the statistics of cholera in the Central Provinces during the twenty years dealt with in this inquiry.

No. I.

STATEMENT *showing the Annual Total Deaths registered from Cholera among the Civil Population in each of the Districts of the Central Provinces from the Year* 1866 *to* 1881.

Districts.	TOTAL CHOLERA DEATHS REGISTERED AMONG THE CIVIL POPULATION IN THE YEARS															
	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Saugor	132	50	256	9,376	...	...	...	...	...	20	2,975	344	780	...	...	289
Damoh	8	22	34	3,196	...	...	15	...	...	...	817	...	589	28	...	295
Murwara . . .	?	?	?	?	...	...	...	...	...	26	214	...	115	...	...	722
Jubbulpore . .	3	2	2,940	4,820	1	...	62	2	...	11	1,278	...	299	1	...	1,697
Narsinghpur . .	31	17	573	4,325	...	...	50	...	...	93	4,192	28	1	3	...	779
Hoshangabad . .	?	5	33	2,379	58	5	153	1	...	629	2,371	...	1,055	14	1	50
Nimar	6	5	12	617	...	2	849	10	...	423	223	...	1,385	...	...	16
Burhanpur . .	?	?	?	?	...	2	165	...	...	226	...	...	1,091	...	...	18
Mandla	41	14	1,074	4,343	...	...	...	...	2	47	175	...	655	1,091	...	63
Betul	3	4	19	411	2	...	...	...	...	325	1,353	...	872	164	...	2
Chhindwara . .	67	79	38	103	1	...	...	...	...	650	123	34	505	...	...	223
Seoni	5	30	1,638	2,059	6	...	...	...	...	3	442	23	526	793	1	459
Balaghat . . .	?	?	110	444	...	...	...	...	...	4	65	96	353	1,695	1	148
Bhandara . . .	333	...	142	954	5	...	...	...	...	261	605	421	2,084	2,281	...	819
Nagpur . . .	?	3	291	1,292	1	7	24	...	...	2,111	701	60	3,425	408	...	1,402
Wardha . . .	129	1	371	1,759	1	2	267	...	...	2,015	443	...	3,035	35	...	857
Chanda . . .	69	...	49	740	...	...	7	1	...	551	3,248	5	2,630	1,298	...	296
Sironcha* . . .	620	1	5	...	32	...	...	...	...	20	135	169	...	...	...	...
Raipur	294	1	3	10,165	...	...	...	1	...	4,449	105	1,985	17,076	11,402	93	668
Bilaspur . . .	2,126	19	4	9,386	...	...	...	20	...	2,525	1	70	2,928	8,040	48	210
Sambalpur. . .	664	...	...	710	...	1	...	309	12	254	658	183	1,581	322	186	127
Total . .	4,531	253	7,592	57,079	107	19	1,592	344	14	14,643	20,124	3,418	40,985	27,575	330	9,140

* Upper Godavari.

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Central Provinces for the Twenty Years from* 1862 *to* 1881.

Years.	Cholera Deaths Registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera prevalent in eastern and southern districts.														...	...	?
1863	Cholera epidemic in eastern and northern districts.														...	...	43·78
1864	Cholera generally diffused over the whole province.														...	...	36·54
1865	Cholera virulently epidemic all over the province.														42,111	10·40	41·93
1866	Cholera prevalent only in southern and eastern districts.														4,531	0·60	43·78
1867	Cholera subsided to minimum prevalence.														253	0·03	59·87
1868	7	12	9	23	340	1,562	3,437	1,717	374	83	21	7	?	?	7,592	2·18	31·44
1869	70	134	749	1,837	9,799	22,823	12,077	7,050	2,127	391	16	6	?	?	57,079	8·30	49·42
1870	3	3	...	1	...	36	35	25	4	...	...	...	65	42	107	0·01	50·18
1871	...	...	...	2	3	3	1	3	...	...	...	7	10	9	19	0·003	48·29
1872	31	11	41	184	111	214	285	487	148	60	13	7	904	688	1,592	0·70	52·22
1873	1	41	210	71	...	...	...	...	4	7	10	...	185	159	344	0·05	40·16
1874	...	...	...	...	...	1	1	...	...	...	...	12	5	9	14	0·002	54·24
1875	...	7	93	77	984	1,654	2,220	6,224	2,624	465	237	58	7,858	6,785	14,643	1·97	56·53
1876	12	7	407	1,032	1,825	3,835	5,176	5,062	1,234	269	1,076	198	10,222	9,902	20,124	2·72	43·69
1877	205	303	288	259	390	943	384	187	52	304	103	...	1,960	1,458	3,418	0·46	50·19
1878	...	4	14	181	4,503	8,155	11,815	7,986	3,942	804	421	3,160	21,707	19,278	40,985	5·53	50·09
1879	8	120	469	4,049	10,998	7,060	3,104	1,198	524	41	4	...	14,574	13,001	27,575	3·72	52·90
1880	1	...	32	94	12	2	2	91	86	9	...	1	167	163	330	0·04	48·55
1881	12	83	152	494	1,086	1,519	958	1,961	1,969	813	90	3	4,729	4,411	9,140	1·23	54·07
Means	25	52	175	589	2,147	3,415	2,821	2,285	935	231	142	247	5,199	4,659	13,521	2·23	47·78

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the Central Provinces in Inches and Cents for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	RAINFALL IN INCHES AND CENTS IN THE MONTHS OF												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	No information.												?
1863	0·42	0·35	1·23	0·51	0·45	8·79	11·93	8·90	8·09	2·57	0·38	0·16	43·78
1864	0·24	0·05	0·13	0·64	3·87	4·40	10·98	10·12	5·60	0·12	0·38	0·01	36·54
1865	0·78	1·89	0·71	0·19	0 26	6·74	14·07	9·33	6·66	0·71	0 54	0·05	41·93
1866	0·07	0·51	0·22	0·61	0·19	5·74	15·84	13·85	6·11	0·39	0·07	0·18	43·78
1867	0·11	0·07	1·05	1·25	0·60	10·60	14·51	17·51	11·08	2·87	0·15	0·07	59·87
1868	1·36	0·38	0·47	0·07	0·42	7·37	9·68	6·27	5·18	0·16	0·00	0·08	31·44
1869	0·08	0·12	0·74	0·22	0·37	4·26	15·54	12·51	10·96	3·93	0·02	0·67	49·42
1870	1·22	0·13	1·02	0·53	0·02	10·69	16·94	8·28	7·41	3·35	0·59	0·00	50·18
1871	0·61	0·49	0·04	0·13	1·03	12·54	15·37	6·61	10·97	0·12	0·22	0·16	48·29
1872	0·07	0·08	0·37	0·93	0·07	9·03	15·99	14·57	8·54	1·88	0·04	0·65	52·22
1873	0·20	0·36	0·53	0·07	0·76	3·08	13·25	10·07	11·35	0·23	0·01	0·25	40·16
1874	0·39	0·23	0·19	0·04	0·71	12·62	16·40	15·47	7·21	0·90	0·05	0·03	54·24
1875	0·30	0·50	0·01	0·12	0·61	11·37	20·87	10·48	9·89	2·35	0·00	0·03	56·53
1876	0·00	0·00	0·41	0·00	0·45	3·67	16·45	11·23	11·01	0·47	0·00	0·00	43·69
1877	2·94	1·09	0·72	2·31	1·99	9·17	11·76	11·15	4·18	3·10	0·20	1·58	50·19
1878	0·28	1·00	0·23	1·10	1·92	3·42	16·14	16·36	7·50	1·71	0·26	0·17	50·09
1879	0·00	0·55	0·00	0·02	2·97	8·98	9·99	19·81	7·01	3·28	0·29	0·00	52·90
1880	0·00	0·18	0·02	0·04	0·30	9·27	15·29	8·03	11·69	2·62	1·11	0·00	48·55
1881	0·02	0·11	2·29	0·13	0·43	11·01	17·84	13·47	6·59	1·49	0·69	0·00	54·07
Means	0·47	0·42	0·54	0·47	0·92	8·04	14·67	11·79	8·26	1·69	0·26	0·21	47·78

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the Central Provinces, together with the Average Strength and Ratio of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Totals.			Ratio per Mille of Strength.	
		Cholera.			Cholera.			Cholera.			Cholera.			
	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Admissions.	Deaths.
1862	2,840	14	12	3,013	38	14	4,828	39	15	10,681	91	41	8·51	3·83
1863	2,911	2	1	3,089	97	40	4,864	158	60	10,864	254	101	23·03	9·30
1864	2,920	32	15	2,945	67	23	4,734	222	109	10,599	321	147	30·27	13·87
1865	2,834	54	36	3,098	55	27	4,538	266	143	10,470	375	206	35·81	19·67
1866	2,382	1	1	3,546	24	14	4,382	99	57	10,310	124	72	12·02	6·98
1867	2,403	...	...	3,606	...	...	3,812	...	...	9,821	...	...	...	...
1868	2,483	26	18	3,400	30	11	3,649	7	6	9,532	63	35	6·81	3·67
1869	2,304	71	54	2,831	25	9	3,911	89	47	9,046	185	110	20·45	12·16
1870	2,649	1	1	3,163	1	...	3,118	1	...	8,930	3	1	0·33	0·11
1871	1,981	...	...	3,167	...	...	2,772	4	2	7,920	4	2	0·50	0·25
1872	1,998	1	1	3,086	5	4	2,885	6	4	7,969	12	9	1·63	1·13
1873	2,055	5	4	3,184	...	...	3,500	1	1	8,739	6	5	0·68	0·57
1874	1,994	...	...	3,133	...	...	3,660	...	...	8,787	...	...	...	...
1875	2,092	...	...	3,176	...	...	3,589	25	17	8,857	25	17	2·82	1·92
1876	1,894	5	4	2,864	8	5	3,760	11	6	8,518	24	15	2·81	1·76
1877	1,781	...	...	6,382	9	4	3,485	4	...	11,648	13	4	1·11	0·43
1878	1,735	20	13	6,416	38	19	4,445	187	101	12,596	245	133	19·45	10·56
1879	1,603	2	1	5,911	18	4	4,987	99	55	12,501	119	60	9·51	4·89
1880	1,537	1	1	5,625	...	...	4,755	38	25	11,917	39	26	3·27	2·18
1881	2,298	25	14	4,832	24	14	4,062	...	...	11,192	49	28	4·37	2·50

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the Central Provinces during the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	2,840	1,161	1·21	86	3,013	2,340	1·62	37	4,828	1,400	2·78	38
1863	2,911	1,932	0·10	50	3,089	1,496	6·48	41	4,864	3,801	4·16	38
1864	2,920	2,804	1·14	47	2,945	2,452	2·73	34	4,734	2,187	10·15	49
1865	2,834	2,773	1·95	60	3,098	2,598	2·12	49	4,538	3,008	8·84	54
1866	2,382	1,042	0·09	100	3,546	2,202	1·09	58	4,382	2,285	4·33	57
1867	2,403	...	...	...	3,606	...	...	...	3,812	...	...	...
1868	2,483	2,286	1·14	69	3,400	1,340	2·24	37	3,649	1,212	0·5	86
1869	2,304	2,259	3·14	76	2,831	2,812	0·89	36	3,911	3,103	2·8	53
1870	2,649	627	0·16	100	3,163	1,256	0·08	...	3,118	637	0·16	...
1871	1,981	...	...	...	3,167	...	...	...	2,772	837	0·48	50
1872	1,998	1,040	0·09	100	3,086	2,008	0·25	80	2,885	745	0·80	67
1873	2,055	553	0·90	80	3,184	...	...	...	3,500	761	0·13	100
1874	1,994	...	...	...	3,183	...	...	...	3,660	...	...	...
1875	2,092	...	...	...	3,176	...	...	...	3,589	771	3·24	68
1876	1,894	357	1·40	80	2,864	1,543	0·52	62	3,760	1,244	0·88	54
1877	1,781	...	...	...	6,382	2,810	0·32	44	3,485	1,386	0·29	...
1878	1,735	1,275	1·57	65	6,416	4,968	0·76	50	4,445	3,326	5·62	54
1879	1,603	951	0·21	50	5,911	2,147	0·84	22	4,987	1,937	5·11	55
1880	1,537	376	0·26	100	5,625	...	...	...	4,755	,119	1·79	66
1881	2,298	903	2·77	56	4,832	1,146	2·09	58	4,062	2...	...	...

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera as represented by the Death-rates registered among the Troops and Jail Populations, and among the Civil Population, in the Central Provinces, for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Wheat.*

Years.	Cholera Death-rate per Mille of Strength or Population.					Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Cents per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Population.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	4·22	4·66	3·11	3·83	?	?	?	?	?	?	44·33
1863	0·34	12·95	12·33	9·30	?	43·78	2·00	9·75	28·92	3·11	33·33
1864	5·14	7·81	23·02	13·87	?	36·54	0·42	8·91	26·70	0·51	25·00
1865	12·70	8·71	31·51	19·67	10·40	41·93	3·38	7·19	30·06	1·30	18·33
1866	0·42	3·95	13·01	6·98	0·60	43·78	0·80	6·54	35·80	0·64	14·00
1867	...	...	...	...	0·03	59·87	1·23	12·45	43·10	3·09	22·00
1868	7·29	3·23	1·64	3·67	2·18	31·44	2·21	7·86	21·13	0·24	21·33
1869	23·44	3·18	12·02	12·16	8·30	49·42	0·94	4·85	39·01	4·62	12·66
1870	0·38	...	...	0·11	0·01	50·18	2·37	11·24	32·63	3·94	17·66
1871	...	...	0·72	0·25	...	48·29	1·14	13·70	32·95	0·50	26·48
1872	0·50	1·30	1·39	1·13	0·22	52·22	0·52	10·03	39·10	2·57	25·66
1873	1·95	...	0·28	0·57	0·05	40·16	1·09	3·91	34·67	0·49	25·91
1874	...	...	...	...	0·002	54·24	0·81	13·37	39·08	0·98	28·63
1875	...	...	4·74	1·92	1·97	56·53	0·81	12·10	41·24	2·38	32·04
1876	2·11	1·74	1·59	1·76	2·72	43·69	0·41	4·12	38·69	0·47	34·22
1877	...	0·63	...	0·43	0·46	50·19	4·75	13·47	27·09	4·88	14·60
1878	7·49	2·96	22·72	10·56	5·53	50·09	1·51	6·44	40·00	2·14	13·20
1879	0·62	0·67	11·03	4·89	3·72	52·90	0·55	11·97	36·81	3·57	14·66
1880	0·65	...	5·26	2·18	0·04	48·55	0·20	9·61	35·01	3·73	30·51
1881	6·09	2·90	...	2·50	1·23	54·07	2·42	11·57	37·90	2·19	32·20

No. VI.

STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the Central Provinces for the Twenty Years from* 1862 *to* 1881.

Districts.	Stations.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Saugor . .	Saugor . .	No information.	*50·03	19·38	30·50	67·53	70·10	31·00	50·87	53·50	68·91	46·66	41·61	68·81	60·75	53·20	27·34	36·58	39·33	37·11	27·39
Damoh . .	Damoh . .		*45·64	37·54	52·70	23·81	76·70	23·20	51·80	48·30	56·05	51·20	59·41	60·91	65·75	41·70	54·86	54·05	44·48	29·71	42·02
Murwara . .	Murwara . .		No information.																		
Jubbulpore .	Jubbulpore .		59·45	45·93	60·42	53·11	73·10	28·80	62·77	77·78	59·22	67·19	46·11	86·93	51·63	56·63	48·37	34·48	50·27	50·25	50·05
Narsinghpur	Narsinghpur		*48·72	45·52	40·51	52·70	84·48	17·63	48·31	46·93	70·20	58·60	47·56	53·30	74·90	41·39	55·03	53·84	50·37	41·55	43·93
Hoshangabad	Hoshangabad		*43·18	22·68	30·36	35·96	75·94	29·60	44·10	32·82	67·31	36·19	42·10	44·70	63·23	50·45	37·47	50·27	51·71	58·14	68·14
Nimar . .	Khandwa .		†36·30	†36·30	11·89	29·30	56·15	38·51	32·78	32·71	21·31	38·02	30·92	30·99	31·28	25·83	30·44	44·16	36·93	20·22	33·45
Burhanpur .	Burhanpur .		No information.																		
Mandla . .	Mandla . .		†48·59	26·69	37·14	41·12	56·65	30·80	60·15	43·17	52·20	61·10	47·10	68·95	62·10	45·40	46·69	45·13	52·85	61·87	61·75
Betul . . .	Badnur . .		23·91	38·81	29·16	36·10	64·57	20·74	31·94	43·70	47·01	39·04	26·79	30·46	54·23	55·64	49·97	50·89	50·54	38·88	45·80
Chhindwara	Chhindwara		*40·68	35·00	43·68	31·41	48·24	25·71	51·57	46·07	33·97	48·44	30·36	45·48	50·80	40·71	49·93	53·89	44·67	38·66	52·45
Seoni . . .	Seoni . . .		*48·02	45·67	57·95	42·05	52·70	31·40	57·06	59·90	45·28	57·29	42·53	60·91	65·75	41·70	54·86	54·05	52·90	51·60	54·23
Balaghat . .	Balaghat . .		†65·99	†65·99	†65·99	†65·99	67·92	43·90	70·84	72·63	75·75	74·20	48·08	56·14	71·15	56·10	68·54	64·81	71·79	88·58	62·92
Bhandara .	Bhandara .		*46·36	50·52	53·60	42·80	59·85	30·72	45·97	46·98	52·43	56·27	47·01	51·61	58·22	38·45	61·95	58·53	48·84	63·40	67·20
Nagpur . .	Nagpur . .		39·69	34·66	44·56	43·11	57·75	43·11	33·38	41·63	46·75	40·94	30·63	40·88	54·86	37·42	56·85	62·82	52·18	33·54	59·76
Wardha . .	Wardha . .		22·18	13·76	45·81	37·06	50·52	25·68	28·29	47·79	29·19	33·13	29·85	30·18	49·37	32·05	35·76	46·35	45·43	34·14	61·34
Chanda . .	Chanda . .		41·88	64·53	49·90	45·70	61·95	34·59	47·30	59·61	38·53	48·70	38·33	45·89	50·84	34·85	35·08	58·96	67·17	50·08	57·62
Sironcha . .	Sironcha . .		*41·36	27·65	34·19	40·50	48·69	30·73	49·17	46·22	31·92	51·26	34·68	55·67	49·21	27·79	46·14	51·38	58·96	42·99	42·51
Raipur . .	Raipur . .		*51·68	23·18	42·94	61·75	45·10	35·82	62·02	57·15	38·58	72·24	35·16	72·24	53·86	43·56	46·22	45·28	63·66	46·47	59·08
Bilaspur . .	Bilaspur . .		34·30	19·70	35·81	36·07	38·70	31·20	56·18	48·58	41·52	42·39	33·88	56·18	40·86	44·21	80·63	42·92	44·65	64·20	65·32
Sambalpur .	Sambalpur .		*44·50	41·19	29·56	45·76	48·41	44·28	54·55	48·05	41·64	69·45	51·04	70·47	65·29	63·18	67·61	43·49	78·53	71·22	72·41

* Average of five years from 1865 to 1869.

† Average of five years from 1867 to 1871.

Referring the reader to an examination of these tabular statements, we proceed to a description of the circumstances attendant on the cholera of each year.

1862.—There are no statistics to show the prevalence of cholera among the civil population of the Central Provinces during the first three years of the series, and for the next three years the returns show only the gross cholera mortality of the year, and not its distribution by months. During the first three years—1862 to 1864 inclusive—the army and jail returns furnish our only guide to the rate of prevalence of cholera among the civil population. It is known, however, that the disease was more or less prevalent in 1862 in the eastern and southern districts of the province among the civil population, and the army and jail returns show that it was present in some considerable activity in other parts of the province also.

The cholera death-rate for the year 1862 of the troops and jails together was 3.83 per mille of their combined strength. Among the European troops the rate was 4.22, and of the three stations, Saugor, Jubbulpore, and Kampthi, occupied by them, Kampthi alone recorded cholera in this year. The total average strength of the European troops at this station was 1161; the number of cholera admissions was 14, and deaths 12. Of the admissions, 12 were in October and 2 in November (see Table No. IV.) Among the Native troops the rate was 4.66, and of the three stations, Kampthi, Hoshangabad, and Sironcha, occupied by them, the first and last both recorded cholera in this year; Kampthi, out of a total average strength of 2231, recorded 31 admissions and 11 deaths, and Sironcha, average strength 109, recorded 7 admissions and 3 deaths. Of the 38 admissions, there were 10 in August, 23 in September, 4 in October, and 1 in November. Among the jail populations the rate was 3.11; and of the 17 jails in the province, the 4 following recorded cholera in 1862, viz.:—Raipur, strength 505, admissions 29, deaths 11; Nagpur, 574, 2 and none respectively; Mandla, 63, 7 and 3 respectively; and Sambalpur, 158, a single admission, which proved fatal; total, 39 admissions and 15 deaths. Of the admissions, there were 1 in April, 36 in July, and 2 in August. The returns show that the bulk of the mortality among these three classes occurred during the months of July, August, September, and October, that is, during the season of the south-west monsoon.

Regarding the rainfall of the year there are no statistics. But food in this year was exceptionally cheap; the average price of the staple food-grain, wheat, was 44.33 sers the rupee, which is cheaper by 10 sers the rupee than the price ruling in the most favourable of subsequent years, viz., 1876, when the average rate was 34.22 sers the rupee.

1863.—In this year cholera appears to have prevailed with renewed epidemic activity. The disease is known to have been rife among the civil population in the eastern and northern districts of the province, whilst among the troops and jail populations, taken together, the death-rate rose to 9.30 from 3.83 in the year before. The disease is supposed to have been imported by pilgrims returning from Puri, in the Orissa division of the Bengal Province, but there is no evidence to substantiate the supposition.

Among the European troops the death-rate in 1863 was only 0.34, and out of the five stations occupied by them, only Kampthi, strength 1112, and Jubbulpore, strength 820, recorded cholera. In the first there was only 1 admission and 1 death, in the other a single admission and no death. One admission was in June, at Jubbulpore; the other in November, at Kampthi. Among the Native troops the rate was 12.95, but of the five stations occu-

pied by them only Kampthi recorded the disease; strength 1496, admissions 97, and deaths 40. Of these admissions, there were 5 in July, 15 in August, 21 in September, 49 in October, and 7 in November. Among the jail populations the rate was 12.33; and of the 17 jails in the province, no less than 10 recorded cholera, viz.:—Sambalpur, strength 215, admissions 1, and deaths 1; Raipur, 393, 21 and 11 respectively; and the others, Bhandara, 400, 29 and 9; Nagpur, 446, 20 and 8; Mandla, 81, 16 and 7; Jubbulpore, 1200, 29 and 8; Saugor, 340, 1 and none; Narsinghpur, 223, 12 and 2; Seoni, 314, 28 and 14; and Mandlaisir, 189, 1 admission and no death. Of the 158 admissions, there were 1 in January (at Mandlaisir, in the Indore State), 33 in June, 94 in July, 1 in August, 6 in September, 22 in October, and 1 in November. These returns indicate a considerable and widespread prevalence of cholera in the Central Provinces during 1863, and that the disease prevailed mostly during the season of the south-west monsoon; whilst the high mortality among the Native troops and the jail populations may be taken as a fair gauge of the incidence of the disease among the civil population.

The returns for the rainfall of the year are imperfect, but taking the returns for the six stations for which they are complete, it appears to have been considerably below the average, since they give an average fall of only 36.90 inches; whilst the approximate fall arrived at by taking a five years' average fall for the stations wanting returns also gives a fall much below the average. Guided by the results of subsequent experience, it is probable that the rainfall of 1863, although very probably below the average, was still more or less greatly in excess of that of the preceding year, which, there is little doubt, was one of drought. The price of food in 1863 was much dearer than in the year before, the average price of wheat having risen to 33·33 sers the rupee from 44.33 sers in the preceding year.

1864.—Cholera prevailed in this year with greatly increased severity as compared with the year before, and was generally diffused over the whole province. The death-rate for the troops and jails together rose to 13.87 from 9.30 per mille of strength in the preceding year. Among the European troops the rate rose to 5.14 from 0.34 in the year before; and of the 5 stations occupied by them, 3 recorded cholera, viz.:—Kampthi, strength 1230, admissions 29, and deaths 13; Saugor, 817, 2 and 2 respectively; and Jubbulpore, 757, a single admission, and no death. Of the 32 admissions, there were 7 in January, 13 in April, 8 in May, 1 in June, 1 in July, 1 in August, 1 in September, and 1 in October. Among the Native troops the rate fell to 7.81 from 12.95 in the year before; and of the 5 stations occupied by them, the 3 following recorded cholera, viz.:—Kampthi, strength 1446, admissions 49, deaths 16; Hoshangabad, 358, 13 and 5; and Raipur, 658, 5 and 2 respectively. Of the 67 admissions, there were 13 in February, 2 in March, 14 in April, 21 in May, 15 in June, and 2 in July. Among the jail populations the rate rose to 23.02 from 12.33 in the preceding year. Out of the 20 jails in the province, the 9 following recorded cholera, viz.:—Sambalpur, strength 175, admissions 67, and deaths 46; Raipur, 343, 43 and 23; Bilaspur, 81, 5 and 3; Chanda, 170, 14 and 5; Nagpur, 559, 28 and 9; Saugor, 348, 46 and 16; Seoni, 268, 10 and 6; Sehore, 95, 6 and none; and Mandlaisir, 148, 3 and 1 respectively. Of the 222 admissions, there were 25 in March, 73 in April, 27 in May, 50 in June, 18 in July, 23 in August, 3 in September, and 3 in October. These returns show the cholera of 1864 as widely and severely prevalent in these provinces, and also as much more active in the early months of this year

than in the corresponding period of either of the two preceding years. The cholera of 1864 appears to have been a continuation, with renewed seasonal energy, of the epidemic of the preceding year. It seems to have abated somewhat in January, the deaths in that month being 7, and to have recommenced activity in February, during which month the number rose to 13; in March there was a still further rise to 27, and in April the disease was in full epidemic force, the deaths being 100. In May they were 57, in June 66, and in July 21. In August they fell to 24, to 13 in September, and the same number in October. In November and December there was no cholera recorded among the troops and jails.

In its seasonal prevalence the cholera of 1864 differs from that of the years 1862 and 1863, in that it commenced epidemic activity and attained maximum intensity at much earlier dates. The disease is described as having in this year invaded the province from the south, "and was supposed to have been imported by pilgrims returning from Pandharpur Fair, in the Deccan." In this year the gangs of labourers along the whole line of railway from Khandesh to Nagpur suffered severely, and the disease "appears to have spread up the Nerbudda valley by a similar chain of susceptible men." The disease was also traced from the country south of the Satpuras by the route through Nimar, Malwa, and Bhopal to Saugor. But, however all this may be, the epidemic activity of the disease in the early part of the year in the Sambalpur, Bilaspur, and Raipur districts would seem to indicate dependence upon the effects of the north-east or cold-weather monsoon, the influence of which at that season of the year very often extends with unusual intensity over that portion of the area of these provinces, although it may not always be attended by actual rainfall. In the Madras Province the north-east monsoon of 1863–64 appears to have given a comparatively abundant rainfall, whilst the hot-weather or south-west monsoon both in 1863 and in 1864 was more or less considerably in defect. Be this as it may, there appears to be no doubt of the fact that the cholera of 1864 in the Central Provinces commenced epidemic activity at an earlier period than in either of the two preceding years, and in the districts nearest to the Madras Province. The epidemic appears to have culminated in April or May, and to have subsided more or less completely in the autumn. The disease, however, again burst out with greatly increased severity in the spring of the following year at the Mahadeo Fair, at Pachmarhi, in February, and soon overspread the entire province.

The rainfall of 1864 was much below the average, and less also than that of the preceding year. The season, in fact, was one of severe and prolonged drought, in which these provinces—both in this and the preceding year—participated with the rest of Southern India generally. The price of wheat rose very high this year, the rates being not very far short of double those ruling in 1862, and about a fourth dearer than in the year before.

1865.—Cholera in this year prevailed with even greater severity than in the year before, and covered the whole province, not a single district escaping. The mortality among the civil population is stated to have been at the rate of 10.40 per mille; the population at this time being estimated at 4,049,148, the total of deaths from cholera would therefore be about 42,111. But there are no details available to show the prevalence of the disease either by seasons or by localities. Among the troops and jails together the death-rate rose to 19.67 from 13.87 per mille of combined strength in the preceding year. Among the European troops the rate rose to 12.70 from 5.14 in the year before, and 4 out of the 5 stations occupied by them recorded the disease, viz.:—Saugor, strength 820, admissions 31, and deaths 18; Jubbulpore, 688,

7 and 6; Kampthi, 1200, 15 and 11; and Sitabaldi, 65, 1 and 1 respectively. Of the 54 admissions, there were 1 in January, 9 in March, 4 in May, 7 in July, and 33 in August. Among the Native troops the rate rose to 8.71 from 7.81 in the preceding year, and 3 out of the 5 stations occupied by them recorded the disease, viz.:—Kampthi, strength 1465, admissions 47, and deaths 21; Hoshangabad, 384, 3 and 3; and Raipur, 749, 5 and 3 respectively. Of the 55 admissions, there were 25 in March, 11 in April, 6 in May, 5 in June, 2 in July, 2 in August, and 4 in September. Among the jail populations the rate rose to the high figure of 31.51 from 23.02 in the year before, and 12 out of the 20 jails in the province recorded the disease, viz.:—Raipur, strength 385, admissions 72, and deaths 40; and the others respectively—Bilaspur, 75, 1 and 1; Bhandara, 294, 49 and 26; Chanda, 212, 4 and 3; Nagpur, 790, 102 and 54; Jubbulpore (civil), 407, 3 and 2; Narsinghpur, 185, 6 and 3; Seoni, 191, 8 and 5; Sehore, 108, 2 and 0; Hoshangabad, 239, 13 and 8; and Nimar, 124, 6 and 1. Of the 266 admissions, there were 9 in March, 36 in April, 51 in May, 22 in June, 129 in July, 17 in August, 2 in September, and 1 in October. As in the year before, these returns indicate considerable cholera activity in the early months of the year. In January a single death is recorded, in February none; but in March the number is 43; in April, 47; in May, 61; in June, 27; in July, 138; in August, 52; in September, 6; and in October, 1. The figures show a revived activity of cholera in March, a check in June, the climax in July, and the final subsidence in October.

In 1865, as in the year 1860, cholera broke out at the fair—formerly held annually—at the Mahadeo cave, in the Pachmarhi Hills, "and the most widespread epidemics of which there are any records followed, not a single district having escaped in either year."

The Mahadeo cave "is held in great sanctity through all the surrounding country. The stream of pilgrims is constant throughout the year, and from 100,000 to 120,000 people assemble annually on the Dinwah River, in the valley below the hill. . . . The spread of the disease over the country in 1865 was (it is averred) so manifestly connected with the dispersion of the pilgrims from the Mahadeo Fair that to prevent its assemblage for the future appeared to be the measure most urgently called for. Orders prohibiting the fair were accordingly issued by Sir R. Temple; and the reasons for the measure were so obvious and good that it was received by the mass of the people with ready acquiescence. At the same time village conservancy rules were issued, and the necessity of turning their attention to improving the sanitary condition of the towns and villages of their districts was urged upon all district officers."

In the Nagpur district the total number of cholera deaths reported by the police amounted to 3022, but even this number was considered to be far below the truth. The disease is said to have been diffused over the district by the pilgrims returning from the Mahadeo Fair, but the Deputy Commissioner, with reference to this epidemic, reported—

"That the outbreak in all these towns was immediately preceded by the advent of pilgrims from Mahadeo I am not prepared to assert, but I have no hesitation in saying so as regards Saonair and the towns first attacked. In the case of Bhewapur and Oomrair it is said that the disease was communicated by people coming from the south, but this is doubtful. The disease exhibited its usual caprice in regard to places attacked. . . . Nor was the advent of pilgrims always followed by the disease; there were many villages, some of whose inhabitants had returned from Mahadeo, that were not attacked at all. There were only two facts that stand prominently forward, other things being equal: first, a town enjoyed immunity in proportion to its cleanliness; secondly, the disease was always worst in towns and villages where there was a river having stagnant or nearly stationary water running through or close by it."

In the Report on the Dispensaries of the Central Provinces for 1865 it is stated that "cholera raged with more or less virulence from the end of February to September in one or other of the districts, committing fearful destruction to human life in most of the villages which it visited, and in many places rendering it dangerous to pass along the thoroughfares of communication." The cholera of 1865 in the Central Provinces, there is little doubt, prevailed with greater epidemic severity than in any year back to 1862, and apparently formed part of the great epidemic which in this year swept over the whole area of Southern India.

The rainfall of 1865, though more abundant than that of the preceding year, was still considerably below the average. The price of food also kept steadily rising, the average rate for wheat having risen to 18.33 sers the rupee from 25.00 sers in the year before and 44.33 sers in 1862. The land, in fact, suffered from famine.

1866.—The great epidemic of cholera in the preceding year had subsided entirely by the end of the month of October, only a few lingering signs of the disease marking the two last months of that year and the early months of this. In 1866 cholera started afresh in a renewed course of epidemic activity, though at a mild rate of prevalence compared with that of the year before. The registration of vital statistics, which was introduced in these provinces for the first time only in the year before, was not effective in all the districts. For the five districts of Murwara, Hoshangabad, Burhanpur, Balaghat, and Nagpur no returns are available; whilst for the four districts of Bhandara, Wardha, Chanda, and Mandla the statistics of the town circles only are given, and not of the rural tracts. However, calculating the deaths upon the population under registration during the year, the cholera death-rate was no more than 0.60 per mille against 10.40 in the preceding year. Among the troops and jails together the rate was much higher, viz., 6.98 against 19.67 in the year before; and this rate probably more correctly represents the incidence of the disease in 1866 among the civil population, more especially as it is wholly made up of the mortality among the Native troops and jails, reduced as it has been by the inclusion of the European troops also (see Table No. V.) Among the European troops the death-rate of this year was only 0.42, that of the Native troops 3.95, and that of the jail populations 13.01.

Regarding the prevalence of the cholera of 1866, it is recorded that only in the Raipur district did the rural circles suffer more severely from the disease than the town circles; but in Bilaspur, Sambalpur, and Upper Godavari districts cholera raged most in the towns. In the town of Raipur cholera is stated to have first appeared in the month of June, and to have quitted it in August; whereas in the country it came in a month earlier, particularly in the Simgah subdivision, on the highway from Sambalpur; and the epidemic continued with more or less violence to within the last month of the year. In 1865 cholera, as in the year before, was spread over every district of the Central Provinces—in the Nerbudda valley districts, in the Nagpur country, and in Chhatisgarh; but the heaviest mortality was registered in the Bilaspur district, and then, in the order of their greater mortality, in Sambalpur, Upper Godavari, Bhandara, Raipur, Saugor, and Wardha. In all the other districts returning deaths from cholera the number was under 100, and in only two did the number exceed 50, and in two others 30, whilst in the other five districts the numbers were all below 10. Towards the close of the year cholera had declined in prevalence everywhere, and had in several districts disappeared altogether, particularly in

the Nerbudda valley districts. The cholera of this year having been mostly confined to the eastern districts of the province, the appearance of the disease was attributed to importation from Orissa by pilgrims returning from the Jaganath temple at Puri, more especially as the eastern districts had been ravaged by cholera annually back to 1860. "It was therefore resolved, in the event of the disease again threatening from that quarter, to attempt to arrest its progress by quarantine."

The rainfall of the year 1866 was again more than that of the preceding year, but still below the average. It was almost wholly confined to the first and second quarters, or the period of the south-west monsoon season. Food was still at famine rates, the average price of wheat being only 14.00 sers the rupee against 18.33 sers in the year before.

1867.—In this year there was a marked abatement in the prevalence of cholera. The death-rate among the civil population was only 0.03 per mille, whilst among the troops and jails there was no cholera recorded in these provinces throughout the year. Among the civil population only 253 cholera deaths were registered against 4531 in the year before, and of this number 35 were returned from the town circles, comprising 158 towns, with an aggregate population of 381,149. The remainder was distributed among 26 out of 88 rural registration circles, the largest number, 78, being reported from the Seoni collectorate. These 78 deaths "were scattered over 47 villages; in 26 villages there was only 1 cholera death in each, and in only 1 village did the number amount to 5. The deaths were spread over nine months of the year, the largest number occurring in November." Seoni is traversed from north to south by a broad stream of commerce, with thousands of people from all parts of Upper India converging on the trunk road at Jubbulpore, and passing through to Nagpur and back again from January to December. As already stated at the close of the previous year's account, it had been resolved to attempt to arrest the progress of cholera by quarantine should the disease threaten to invade the eastern districts of the Central Provinces from Orissa, as it had been held to have done annually in the previous years back to 1860.

"Accordingly, when, towards the end of 1867, it was reported that cholera had broken out at Puri, quarantine was established at the eastern border of the provinces. The fact of cholera having broken out at Puri was at the same time proclaimed through the eastern districts, and efforts made to dissuade the people from pilgrimages; and thus it happened that for once in many years every district in the provinces experienced immunity from cholera."

It will be observed here that these quarantine measures were adopted towards the end of 1867, when the little cholera of the year that was naturally present had already subsided, and it will be remembered that in the previous years of epidemic cholera activity the disease had usually commenced activity in the eastern districts in the early months of the year. In fact, the cholera of 1867 in the Central Provinces was a naturally abating cholera; it received no accession of strength from the Hardwar pilgrim epidemic that raged in the North-Western Provinces and the Punjab during the hot weather of 1867, nor from the Puri pilgrim epidemic of Orissa and Lower Bengal in the autumn of the same year. If the cholera of the Central Provinces is held to have been derived in the previous years—at least as concerns its eastern districts—from Orissa, then it is clear that the disease first appeared in the eastern districts of the Central Provinces in the early part of those years as the extension of an epidemic prevailing in Orissa during the preceding autumn in each instance; and in this view of the case

the extension of the Puri epidemic in October of 1867 would not be felt in the eastern districts of the Central Provinces until the early part of 1868; but, as will be presently seen, those districts remained singularly free from the cholera epidemic of that year in the Central Provinces. Therefore it seems more correct to attribute the immunity of the province from cholera in 1867 to a natural subsidence of the disease than to any effects exercised by the imposition of a quarantine towards the close of the year, when there was no cholera about or to be expected from previous experience in the province.

The rainfall of 1867 was exceptionally abundant, being 12½ inches more than the average, and 16 inches more than that of the preceding year. It is, in fact, the heaviest fall recorded in any previous or subsequent year of our whole series from 1863 to 1881 inclusive. It was, moreover, proportionately distributed over the several quarters. The price of food, too, in this year was much cheaper than in the year before, although the rates were still very high.

1868.—Cholera in this year, the third of the triennial cycle, contrary to the ordinary experience, broke out into fresh epidemic activity, instead of subsiding to a lower rate of prevalence than in the year before. The death-rate among the civil population rose to 2.18 per mille from 0.03 in the preceding year. The mortality returns, which are for the first time in this year complete for the whole province, show a total of 7592 deaths registered from cholera against 253 in the preceding year. They show the presence of cholera in the beginning of 1868 in the districts of Damoh, Narsinghpur, Betul, and Seoni; and in all of these the disease continued more or less persistently active throughout the year, except in Betul, where it showed a fitful character. In February cholera appeared in the districts of Saugor, Jubbulpore, Mandla, and Bilaspur; and in March in those of Chhindwara, Upper Godavari, and Raipur. From all these districts single deaths only are returned from each, except from Saugor, in which the number was three. In April there was a distinct rise in the total cholera mortality of the province, but the three Mahanadi districts remained singularly free throughout the year. This rise goes on steadily increasing during the succeeding months, attains maximum intensity in June and July, and culminating in the latter month with 3437 deaths registered against 9 in March, thenceforward steadily declined to the end of the year, the deaths being 7 in December. The greatest number of deaths were registered in the months from May to September inclusive, and the mortality was heaviest in the districts of Jubbulpore, Seoni, Mandla, Narsinghpur, Wardha, Nagpur, and Saugor. In October cholera subsided rapidly everywhere in the province; in November it was present in 5 only out of the 19 districts under registration, and in December in 4, viz. :—Nimar, Betul, and Seoni, which return single deaths each in that month, and Damoh, which returns 4. The year 1868 began with 7 deaths registered in January, and ended with 7 in December.

In the Jubbulpore district much of the cholera mortality registered occurred among gangs of coolies employed in the Public Works Department on the Northern Road between Nagpur and Jubbulpore, a length of 164 miles. The total number of coolies, men and women, at work in April along this length of road was 8394, of which number 4650 were employed in the Kunhan division—the southern section; and 3744 in the Jubbulpore division—the northern section. Of the Jubbulpore gangs, 1270 were coolies collected in the territories of Myhore and Rewah; the remainder were

drawn from the villages near the road. The coolies on the southern section were all local labourers. The coolies were placed at work in gangs of from 50 to 900 in different parts along the road. A proportion of the local labourers returned to their villages at night; but the gangs were for the most part hutted on the banks of the streams and nalahs, or wherever water was most easily to be obtained.

The cholera first commenced among the gangs in the Ganeshganj valley, which is about 4 miles wide where the road crosses it; and its main drainage channel is the Bijna rivulet, which courses west to east down about the centre of it, and during the hot weather has only a very small stream. The road crosses it in the second furlong of the fifty-sixth mile by a bridge. About a quarter of a mile beyond the fifty-seventh milestone the Motuja nalah crosses the road and enters the Bijna rivulet about three-quarters of a mile below the Bijna bridge. Ganeshganj village is situated near the junction. Midway in its course, between the road and Ganeshganj, the Motuja is fed by the Rainch nalah. In the area formed by the Bijna, the Motuja, and the road 411 labourers from distant districts were hutted on the banks of the Motuja on the 15th April 1868, and employed in breaking stones in the bed of the Motuja. The ground on which they were hutted was black soil and unsheltered by trees, with trap rock cropping up here and there. There are no wells in the neighbourhood. The people of Ganeshganj have no wells, and also drink the water of the two streams mentioned. Both streams have very little water in the hot weather. Pools 2 to 4 feet deep exist in the beds of the nalahs, the water of which is generally used by the people. These coolies arrived in excellent condition in the Ganeshganj valley, and kept in health. They went nowhere but to market in the Ganeshganj valley. Of the 411 coolies, 200 had been hutted on the banks of the Motuja since the preceding January, and 211 since the 23d March; the first batch had come from Jokye, on the Mirzapur road, and the other from Myhore. Besides these, there were employed in the Ganeshganj valley 125 local labourers, who were not hutted with the others; they used to go home to their villages in the evening, and return to work in the morning. They were employed in digging kankar, some near Ganeshganj and some near Gumwara village, about 1¼ mile above the Bijna bridge. They did not necessarily mix with the hutted gangs.

On the 16th April the first case of cholera occurred. It was that of a woman, aged about 20, who, while taking her mid-day rest of two hours, from 12 to 2, was struck down by the disease about 1 o'clock, and by 5 P.M. —in four hours—was dead. Her husband was with her. She was a remarkably strong and healthy woman. The second case was that of a strong young man, aged about 25. He was seized about midnight of the 16th, and was dead before morning dawned. During the 17th 5 more were attacked, and 2 died by the evening. In the evening the gang was moved about a quarter of a mile up the Motuja nalah, taking with them their 3 sick coolies, and leaving their huts behind. On the morning of the 18th they were again moved, with the 3 sick coolies, up about 300 yards, near to the Motuja nalah bridge. On the 20th the party was moved, with the 3 sick coolies, to the sixty-third mile, about half a mile from Gogri. The 3 sick coolies eventually recovered, and no fresh case or death occurred in the gang from the moment they quitted their huts on the evening of the 17th. Of this gang, 7 were attacked, 4 died, and 3 recovered. They hutted themselves on the low black-soil ground near the sixty-third milestone, and dug kachcha wells, the water of which they used.

Another gang, 89 strong, was attacked on the 18th. The coolies went to their work of breaking basalt, as usual, in the bed of the Motuja nalah. About 9 A.M. a coolie was attacked; soon after 2 more; and before evening the 3 were dead. In the evening they moved half a mile up the Rainch nalah, deserting their huts. During the night of the 18th and day of the 19th 12 more were struck down. In the evening of the 19th they were marched, with their 12 sick coolies, towards Chaparah, where they arrived on the morning of the 20th, and squatted in a tope of mango trees opposite the sixty-fourth milestone, about one mile from the village of Chaparah and a quarter of a mile from the road. On the 25th they proceeded, and joined the first gang near the sixty-third mile, where they hutted themselves. During the night-march this gang lost 8 of the 12 sick coolies. The 4 who survived that night recovered. From the moment they quitted their camp on the evening of the 19th they had no fresh case. Of this gang, 15 persons were attacked, of whom 11 died and 4 recovered.

A third gang, 280 strong, remained in their original position on the banks of the Motuja. About noon on the 21st the disease appeared among them, and from that date up to the 25th they had 12 cases, of which 9 died. On the 25th they deserted their huts and marched about half a mile. On the 29th they were again moved in two parties—one to dig kankar at Gumwara, a village about 1½ mile west of Bijna bridge, and their first camp; and the other to quarry and break limestone at Gunai, one mile east of the sixty-first mile. From the 25th April, the day they moved away, they had no new cases.

The next outbreak occurred in a gang of local labourers employed 32 miles away from the gangs first attacked. This gang, of 125 village coolies, lived at Kaladi, about a mile east of the twenty-fourth mile and the Hulki road bungalow. They were employed breaking basalt in the Turaya nalah, near the road, the water of which they drank. The disease appeared on the 29th April, on which day one of the Mates was the first victim. He went to Hulki to be paid for coolies; at noon he was returning to Kaladi, and fell sick at the Turaya, and there died on the bank at 3 P.M. He was a strong healthy man about 32. On the 1st May 4 men of his gang were attacked, of whom 1 died the following day. After this the gang ceased to work, and no trustworthy account could be obtained.

Such is the account given by Mr. O'Donnell, the Executive Engineer of the Jubbulpore division, of the outbreak of cholera among his coolies in April 1868.

"From this date outbreaks in the different gangs were more frequent, but the disease did not spread rapidly." In the southern section of the road no gang was attacked till the 17th May, when a severe outbreak occurred in a gang of 900 coolies hutted on the border of a tank on the top of the Korai Ghat, 60 miles from Nagpur and 50 miles south of Ganeshganj, where the disease first appeared. Between the middle of May and the first week in June many of the gangs suffered severely. The disease then subsided, and after the middle of June, though isolated cases occurred here and there, the mortality was very slight. In the course of the epidemic, of the 1270 imported coolies employed, 170 were attacked and 119 died, a mortality of 9.3 per cent. The mortality among the local labourers could not be ascertained, as on the first alarm of cholera numbers went off to their homes. On the southern section of the road, however, where the local labourers were chiefly employed, the disease was much less severe, and several large gangs escaped entirely.

On the 3d June a heavy fall of rain occurred, which was very general over the districts of Jubbulpore and Seoni. From this date the number of villages attacked increased daily, but it was not till the middle of July that cholera reached its greatest amount of diffusion. In a large proportion of the villages attacked not more than one or two cases occurred; in others the mortality ranged as high as 25 per cent. of the population. On the receipt of information that cholera had broken out among the gangs of coolies employed on the Jubbulpore road, quarantine was at once established near the entrance of the large towns north and south of the affected locality; strict quarantine was observed also at all the jails. The measure failed completely in affording protection against the invasion of cholera. In the case of the towns, in no case did quarantine succeed in preventing the invasion of the disease; and in the case of the jails, out of six where cholera prevailed in the neighbouring town, the disease effected an entrance in four. In the matter of isolation of the persons attacked by cholera, "instructions were issued that at all the chief towns, and wherever medical treatment could be provided, temporary sheds should be erected to which all fresh cases should be taken for treatment, and that especial care should be taken to disinfect the discharges of all patients treated." But so great was the dislike to these measures, and the consequent concealment of the disease, that the civil surgeon and Deputy Commissioner at Seoni deemed it necessary to make going to the cholera hospital optional, "even of the poorest people; and it soon ceased to be used, save by an occasional traveller."

As soon after the epidemic of 1868 as the weather permitted, Dr. S. C. Townsend, Sanitary Commissioner for the Central Provinces, proceeded to inspect the districts in which cholera chiefly prevailed; and in the course of the cold weather he investigated the circumstances connected with the prevalence of cholera in upwards of 300 villages within the epidemic area. His inquiries were chiefly directed to the nature of the soil, water-supply, and general sanitary condition of the places in which cholera prevailed, and he endeavoured to trace as far as possible the relation between the rainfall and the diffusion of cholera. The result of these inquiries Dr. Townsend embodied in a separate paper, which is appended to his Annual Sanitary Administration Report for 1868. From this treatise, which is voluminous and full of interesting and useful details, a few extracts bearing upon the history of the cholera outbreak among the coolie gangs in the Ganeshganj valley are here introduced.

In connection with the state of the weather at the time of the outbreak of cholera, estimated from "an abstract of meteorological observations taken at Nagpur, the nearest locality at which any complete and reliable observations had been taken," it is stated—

"Nagpur, indeed, is upwards of 100 miles distant from the locality in which the outbreak of cholera occurred, and at an elevation lower by 500 feet; but, on the other hand, the locality in which cholera broke out is a valley probably the lowest between Seoni and the Nerbudda. The soil and geological formation are the same as at Nagpur; and, as regards the amount of rain, the registers at Lakhnadaon, the tahsil station, 8 miles to the north, and at Seoni, 28 miles to the south, are both, as at Nagpur, blank for the months of April and May. . . . The mean temperature of the month of April 1868 was 1.5° above that of April 1867. For the ten days, including the date of the outbreak, the difference was more considerable :—

10th to 20th April.	1867.	1868.	Difference.
Daily mean highest temperature . . .	102·5	105·8	3·3
Mean lowest temperature	80·5	73·5	7·0
Mean daily temperature	93·1	88·0	5·1

The hygrometer showed a mean difference between the dry and wet bulb of 25° at 10 A.M. and 31° at 4 P.M. for the ten days, including the date of the outbreak. On this point there are no data for comparison with former years. The prevailing winds for the ten days were W., S.W., and N.W., with a mean velocity of 98 miles in the 24 hours. At this time of the year the wind blows with the greatest velocity between the hours of 10 and 4. The nights are usually calm, as the wind is very light."

Regarding the rainfall—

"The latest fall registered at Seoni and Lakhnadaon, distant respectively 27 and 8 miles from Ganeshganj, the locality in which cholera first broke out, occurred between the 23d and 25th March, when rather more than an inch fell at both places. From this time to the end of May there was an almost total absence of rain over the districts of Seoni, Mandla, and Jubbulpore, above the Ghats."

Regarding cholera—

"The general health of the labourers prior to the outbreak is reported to have been good. Unfortunately the systematic registration of deaths in the Seoni district is confined to the Sadar tahsili, and this does not include the locality where the first outbreak of epidemic cholera occurred. In the monthly returns of this tahsili, however, which contains 574 villages, with a population of 155,000 persons, 78 deaths from cholera were registered in the nine months preceding April 1868. They were reported as follows:—July 1867, 3 deaths from 3 villages; August, 15 from 10; September, 16 from 11; November, 22 from 13; and December, 5 from 1: January 1868, 2 from 1; February, 2 from 2; and March, 3 from 3 respectively. Again, in the returns from the Barji police circle, in the Jubbulpore district, but still in the trap formation south of the Nerbudda, and traversed by the road, 6 deaths from cholera are returned in January and 6 in February. In these instances 2 deaths happened in villages on the road, and 1 is reported from Hulki, where the second outbreak among the coolies subsequently occurred. . . . It is, moreover, worthy of note that out of 12 police circles in the Jubbulpore district, many of them of much wider extent, deaths from cholera appear in the returns from the circle of Barji only. . . . Cholera did not break out in the village of Ganeshganj until some days later than its appearance among the coolie gangs. Neither the exact date of the outbreak nor the number of villages that suffered is known, in the police report the deaths from the villages being mixed up with those from the gangs in the valley. The villagers draw their water from the Bijna River. . . . With regard to the origin of the first outbreak in the Ganeshganj valley, there is no evidence of the importation of the disease from elsewhere. . . . On the other hand, in favour of a supposition that infection may have been communicated from without, are the facts that the party was located within 300 yards of a road forming a line of communication between the termini of two railroads, and that the individuals first attacked belonged to the gang hutted nearest to the road. . . . It must, however, be borne in mind that between the locality of the outbreak and the nearest railway terminus 57 miles of road intervened, along which were numerous encampments of coolies and several bazars and villages, which subsequently proved to be susceptible of the choleraic influence. To support an opinion that the origin of the disease was local we have the want of evidence of importation, and the fact that in the early part of the year prior to the epidemic outbreak deaths reported by the police to be the result of cholera had been rather frequent in the villages of that tract of country."

The atmospheric conditions under which the disease first appeared in the Ganeshganj valley coolie gangs are thus summarised:—

"The hot weather had fairly set in; the temperature of the air in the shade ranged from 80° in the early morning to 106° in the afternoon; the power of the sun's rays to which these people were exposed working on black rock rose daily to about 130°; and it was the driest time of the year, hot winds were blowing, the last fall of rain had occurred three weeks previously, and if we may judge by observations taken at Nagpur, the hygrometer showed a mean difference of 34° between the wet and dry bulb at 4 P.M.; the movement of the air through the day had a velocity of 7 or 8 miles per hour, the nights were more still, the sky during the nights and mornings was clear, and clouds frequently gathered in the afternoon."

The locality is thus described:—

"The locality is not considered unhealthy, the valley is wide and open; from the nature of the soil and substrata, the range of temperature would probably be high; and

it is almost entirely without trees. Two streams intersect the valley, but with beds formed of non-porous rock and confined within high banks; they add little to its moisture, and, in fact, by their means the area between them is perfectly drained, and may be said to be without subsoil water."

The personal condition of the coolies is thus summarised :—

"The actual site on which the coolies were hutted was high, and for the most part bare rock. The water in the stream was very low, the pools being almost stagnant; it was clear and free of weeds, but there can be no doubt that it was habitually fouled by excrementitious matters. The personal condition of the coolies was probably not very different from that of the village population; they were more exposed to the heat of the sun and had harder work, but they were better fed, and they had been in good health up to the date of the outbreak."

Referring to the appearance of cholera in the coolie gang at Kaladi on 29th April, it is noted that—

"The choleraic influence, however, was apparently present at Kaladi a day or two earlier; for two young women of the Dhimar caste that left Kaladi on the morning of the 26th to go to Mohogaon, a village near Lakhnadaon, 24 miles distant, were seized with cholera by the way. On arriving at their destination they sent to the dispensary at Lakhnadaon for medicine, and both recovered."

In connection with the outbreak in the Hulki valley, the following circumstance that occurred at the village of Sukri, 4 miles distant, is related :—

"On the 20th April a Brahmin, with his wife and daughter, a girl 15 years of age, returning to Nagpur from Benares, where he had been on a pilgrimage, arrived at Sukri in a gharry, and halted on the encamping ground. He stated that he had left Mirzapur two days previously, and had travelled to Jubbulpore by rail; that his daughter had been attacked that morning when crossing the Nerbudda. He was anxious to obtain medicine for his daughter; and finding there was none to be had at Sukri, he went on. Nothing could be traced of the party afterwards; they were at Sukri about an hour. Before they left a Gond woman belonging to the village returned from the jungle with some grass, some of which she sold to the Brahmin to place in the bottom of the gharry. Shortly after the party left the Gond woman was seized with purging and vomiting, and died the next day; her husband said she had drank foul water in the jungle. No other cases occurred in the village at this time. A fortnight afterwards a mehter's boy was attacked and died, and two other cases followed. Sukri is situated on black cotton soil, and a good well on the encamping ground forms the sole water-supply."

Section III. of Dr. Townsend's Report contains a "Review of the history of the epidemic, and conclusions with reference to the conditions that appear to favour the spread of the disease among the people, and the measures that are required to remove those conditions." In paragraph 245, page 69, it is stated—

"With reference to the effect of states of the atmosphere on the diffusion of cholera, the evidence afforded in the report is so far imperfect, that the only observations recorded were not taken within the tract of country over which the disease prevailed with the greatest intensity. Subsequent observations, however, show no great difference between the climate of Nagpur, Seoni, and Jubbulpore. . . . No inferences are deducible from the records of barometric pressure. As regards temperature and moisture, it is scarcely possible to estimate the direct effect of these conditions apart from their action on surrounding circumstances of soil and water-supply, . . . I think it must be conceded that neither extreme heat nor extreme dryness of the atmosphere checks the development of cholera."

In paragraph 247, page 70, it is stated—

"But while there are numerous facts recorded in the report that strongly support the opinion that the choleraic influence is diffused solely by means of human intercourse, there are, on the other hand, many instances in which the arrival in a town or village of persons suffering from cholera was not followed by an outbreak of the disease among the population; and in the returns from all the circles a considerable number of villages appear from which one or two deaths only were reported. . . . The proportion of villages

attacked varied greatly in different parts of the epidemic area, and in all the districts the greater proportion of the villages escaped. Moreover, frequent instances are given of villages in close juxtaposition where one suffered severely from cholera, while the others experienced complete immunity."

Again, paragraph 248—

"It is evident, then, that all localities, or the populations inhabiting them, are not alike amenable to the effects of the choleraic influence; and we have to consider what information the report affords regarding the conditions that favour the manifestation of the disease. The epidemic prevailed with the greatest severity in the districts of Seoni, Jubbulpore, and a portion of Mandla. These districts extend over a hilly and undulating country, having an elevation above the sea varying from 1300 to 2300 feet, in parts covered with dense forest, in parts open and treeless, having a remarkable variety of soils and substrata, and intersected in all parts by rivers and streams, which for the most part have a rapid fall, and which almost everywhere effect a rapid drainage of the subsoil water. . . . We find that the highest rate of mortality occurred in the trap formation; that the disease also visited with great severity villages along the banks of the Nerbudda, the Hiran, and the Pureyat rivers that traverse the wide alluvial tract of the Jubbulpore district; and that, on the other hand, the proportionate number of villages attacked and the ratio of mortality were comparatively low in the metamorphic tracts of Katangi, in the Seoni district, and the tracts of the same formations and of the sandstones that are found in the district of Jubbulpore."

Paragraph 249—

"The conditions of site, soil, substrata, and water-supply that surround the towns and villages in these various situations differ considerably. In the trap formation the villages are situated on the tops of rocky ridges or on high open plateaux; they are almost invariably built on hard impermeable rock, bare of soil, and where subsoil water is non-existent; in fact, more dry, healthy sites could scarcely be found anywhere. It would appear, then, from the extreme severity with which cholera prevailed in villages under these conditions, that elevation and dryness of site are no protection against the invasion of the disease."

Paragraph 250—

"It would appear, too, that the infecting matter of cholera cannot be always developed in the soil, for in the sites of these villages generally, moisture and subsoil water, and even soil, are non-existent, and notably so in certain villages . . . where the disease raged with extreme violence. A more parched condition than that presented by the trap formation in the hot weather, when cholera more commonly prevails, can scarcely be imagined." Para. 251—"Next only to the trap hills, the banks of the rivers afford the driest sites in the country, . . . and for a considerable margin along the banks the ground is an arid uncultivated waste. . . . I think, then, it may be said that the notion of there being any relation between moisture of the soil and subsoil water and the development of the infecting matter of cholera derives no support from the study of cholera as it prevails in these provinces." Para. 252—"The opinion that a water-supply containing organic impurities is the chief, if not the sole condition under which cholera manifests itself is now, I believe, very commonly held by observers in this country and in England; and there can be no doubt that this doctrine receives very strong confirmation from the facts which we have now been able to collect regarding the spread of cholera in the towns and villages of this part of India."

In paragraph 253 Dr. Townsend observes:—

"In former epidemics cholera has commonly made its appearance early in the year, in March or April, and has reached its maximum diffusion in May and the early part of June, when, in consequence of the rapid drainage that is characteristic of the water-system of the country, the water-supply is scanty." Para. 254—"The epidemic of 1868 was exceptional in its course; the disease appeared in April, but its subsequent progress was slow." Para. 256—"It occurs, moreover, in all epidemics, that when the supply of water in the rivers, tanks, and wells has been replenished by the periodical rains, cholera ceases to prevail, and an outbreak between the middle of September and the commencement of the hot weather is unusual." Para. 262—"The effect of rainfall on the prevalence of cholera cannot be easily shown in a tabular form; for, as it affects only a condition that influences the manifestation of the disease, and probably has but little effect in the transmission of the infecting matter from place to place, excepting in so far as it

affects traffic and intercourse, it cannot be shown how much the spread of the disease in a locality in a particular period is due to the diffusion of the infecting matter, and how much to the prevalence of the conditions under which alone it can take place." Para. 263—"Again, rain would have a very different effect, according to the water-supply of the towns and villages exposed to infection; its effect on a stream or a tank would depend greatly on the amount of the rainfall in relation to the degree of surface pollution of their banks. Where the water is derived from a surface-well or from a well sunk in porous strata, the effect of rain would not be visible for many days, or until a considerable quantity had fallen." Para. 267—"It may be said, then, that the general effect of rain on the prevalence of cholera in these provinces is undoubtedly salutary. Its salutary action is more immediately evident in those tracts of country where the water-supply is chiefly derived from streams and tanks. In tracts of country where the water-supply is derived from shallow wells, and where the soil and substrata are porous, the first effect of rain is to cause an increase in the prevalence of cholera; but when the several sources of water-supply have been fully replenished, cholera everywhere subsides."

Paragraph 268—

"With regard to the character of the impurities in water that are connected with the manifestations of cholera, the descriptions given of the water-supply of the towns and villages where cholera prevailed indicate that the noxious impurity is sewage or other decomposing animal organic matter. The villages that suffered in the greatest degree were all dependent on sources of water-supply more or less evidently liable to such kind of pollution. In the case of the larger rivers, there can be no doubt that the water was polluted by such matter to a terrible extent; and from what may be seen everywhere of the habits of the natives, and their carelessness (particularly of the lower castes) in this respect, there can be little doubt that the water of streams, tanks, and surface-wells is very commonly polluted by sewage matters." Para. 271—"There is, then, reason to believe that when cholera occurs in the hot and dry weather, the development of the disease is often due to the use of water rendered impure by the putrefaction of animal matter that has previously existed in the water. In the rainy season it is no doubt more commonly due to sewage matter conveyed into the drinking-water by surface drainage or by percolation." Para. 272—"Regarding the relation between the use of impure water and the development of cholera, there is no reason to believe that water impregnated with impurities of the kind above described is ordinarily the exciting agent in the production of cholera or the immediate cause of the disease." Para. 273—"It is, indeed, not improbable that the excreta of patients suffering from the disease contain the infecting matter of cholera, and that the disease may be sometimes directly communicated by such matter being introduced into the drinking-water; but that cholera can be rapidly diffused over a wide area by such means is scarcely possible. It is altogether improbable that, in the large number of villages attacked during the dry weather of the present year, choleraic excremental matter can have been introduced into the water-supply; and the pollution of wells or other sources of supply by means of the vessels used in drawing water I believe to be an accident that very rarely occurs." Para. 276—"It would appear, then, that however impure the water used by the population may be, the communication of a special *contagion* is necessary before cholera will manifest itself; that, in fact, an impure water is a predisposing cause, and not the exciting cause, of cholera; and that, in respect of the means by which it spreads, cholera does not differ from other infectious diseases; that as smallpox manifests itself in persons in whom the susceptibility to the disease has not been modified by a previous attack or by vaccination, or as typhus fever attacks those in whom a predisposition to it has been induced by famine and overcrowding, so the *contagion* of cholera takes effect in individuals rendered susceptible to its influence by the reception into or retention in the blood of excretal or other decomposed animal matter."

Paragraph 277—

"With respect to the general population of this country, water impregnated with sewage or other animal matter in a state of decomposition is apparently the medium through which this predisposition to cholera is most commonly produced. It does not follow from this, however, that when cholera is epidemic we must expect to trace every case that occurs, or even every outbreak in a locality, to the use of impure water. What is intended to be asserted is, that impure water is the most common predisposing cause, and that cholera will not prevail epidemically among the population of a tract of country where the water-supply is abundant and fairly protected from pollution. In individual cases, and in bodies of men placed under peculiar and what may be called unnatural

circumstances, other predisposing causes may be in operation." Para. 278—"With regard to other sanitary conditions that may favour the production of a predisposition to cholera, it would appear, from the description given of the sites of the towns and villages that suffered most severely, that dampness and imperfect drainage will not greatly affect the prevalence of cholera, excepting in so far as obstruction to the drainage of a town may tend to endanger the purity of the water in the wells." Para. 279—"The extent to which accumulations of filth and want of proper conservancy directly affect the prevalence of cholera is not easily estimated, purity of water being so intimately dependent on cleanliness of surface; but I think it may be safely assumed that the mortality is greatly aggravated when cleanliness and conservancy are not attended to. . . . Cleanliness of surface, however, will not avail to ward off cholera where the water-supply is impure."

Paragraph 283—

"On the question of the contagiousness of cholera, there is, I think, abundant evidence that the disease is eminently contagious; that in respect of persons predisposed to the reception of the 'contagion' it is as contagious as smallpox; but while the predisposition to smallpox is innate and common to all persons until it has been neutralised by an attack of the disease itself or by vaccination, the predisposition to cholera is acquired, and the proportion of persons in whom it can be induced is limited, and depending chiefly on the intensity of the predisposing causes. It is probable that the predisposition to the disease may be rapidly acquired and as rapidly lost, all that is necessary being the presence in the system of animal organic matter in a septic condition." Para. 284—"On the question of the period occupied by the incubation of cholera, though precise information is rather wanting, there is sufficient evidence that the period varies from a few hours to two days. It does not, however, necessarily follow that because a person who has been exposed to the contagion of cholera does not exhibit symptoms of the disease after a period of two days has elapsed, he is no longer capable of communicating the disease; the contagion, though it may have no effect on the individual, may continue for a longer period to cling to his person or clothes."

Paragraph 288—

"The facts detailed in the foregoing report appear to me to warrant the following conclusions:—1st. That for the production of cholera two conditions are necessary—the presence of a special *contagion*, and a susceptibility to its influence on the part of the person to whom the *contagion* is applied. 2d. That, with respect to the origin of the epidemic of 1868, the evidence is in favour of the *contagion* having been brought from elsewhere, rather than that it was generated in the localities where the disease broke out. 3d. That the subsequent diffusion of the *contagion* was effected solely by means of human intercourse. 4th. That a high temperature and extreme dryness are no obstacles to the diffusion of the *contagion*. 5th. That, with respect to the general population of the country, the imbibation of water containing animal organic impurities is the most common means by which personal susceptibility to the effects of the *contagion* is induced."

Paragraph 289—

"The measures required to prevent or diminish the frequency of the occurrence of epidemic cholera in these provinces, and the mortality which it occasions, are of two kinds—First, measures to be undertaken with the view of preventing the diffusion of the *contagion;* and second, measures for the removal of the conditions under which the personal susceptibility to the *contagion* is induced. Under the first class would be included the prevention of assemblies at fairs or for pilgrimages, by the dispersion of which cholera may be diffused throughout the country, and the establishment of quarantine and such like measures for preventing the transmission of the contagion from one locality to another." Para. 292—"Of the other class of preventive measures against cholera, viz., measures directed to the removal of the conditions under which the personal reception of the contagion is induced, the facts detailed throughout the report show that measures for the general improvement of the water-supply of the people throughout the country are the most essential. Strict attention to conservancy and general cleanliness must form an important part of any general measures of improvement; but the ultimate end to be attained is a plentiful supply of water safe from contamination with animal matter."

Such, in brief, is the substance of the views recorded by Dr. S. C. Townsend as to the nature and causes of cholera, and of the measures necessary to prevent the occurrence of the disease. How far they are confirmed, or the reverse, by the subsequent experience of cholera in the Central Provinces will be seen in the sequel; as also their applicability, or otherwise, to the disease as it is observed to prevail in India generally.

The year 1868 was a season of exceptionally severe drought in the Central Provinces. The rainfall of the year was only 31.44 inches against 47.78 inches, the average fall for these provinces, and 59.87 inches, the exceptionally heavy fall of the preceding year. It is the smallest fall of any year of our whole series from 1863 to 1881 (see Table No. V.), and is only approached in deficiency by the small fall in 1864. The price of food was also very dear in 1868, and verged upon famine rates.

1869.—In this year cholera prevailed with revived epidemic activity, and attained a degree of intensity surpassed only by that of the year 1865 in the whole series of years dealt with in this history. The death-rate of the year among the civil population rose to 8.30 per mille from 2.18 in the year before, and among the troops and jails together it rose to 12.16 from 3.67 respectively. The year 1869 was altogether a very unhealthy year. It is recorded that from the commencement of the year until the rains had well set in smallpox was unusually prevalent and fatal; whilst cholera, appearing earlier than usual, assumed the proportions of a terrible epidemic in the hot weather, and did not entirely disappear till the month of November. In the autumn months malarious fever was everywhere more than usually prevalent, and in some districts carried off even more victims than the cholera epidemic of the hot weather. In fact, as regards the general health of the population of the Central Provinces, the year 1869 was characterised by the prevalence of disease to an extent almost unknown in former years.

As we have seen, the cholera epidemic of 1868 subsided in the autumn of that year, but lingered on to its close, the number of cholera deaths registered in December being seven. The returns for 1869 show that during the first two months of the year there was a general absence of cholera in most of the districts of the province. Saugor, Jubbulpore, Hoshangabad, Betul, and Nimar were the only districts, out of the nineteen under registration at this time, which showed the active presence of cholera in January and February; whilst in one more district—Mandla—the presence of the disease is marked by a single death, recorded in January. In March cholera appeared in the districts of Narsinghpur, Seoni, Nagpur, and Bilaspur; at least this is what is shown by the returns; but in the Sanitary Commissioner's detailed report on the cholera epidemic of 1869 it is stated that in January ten deaths from cholera were recorded in the Gadarwara circle, of Narsinghpur district, and in February nine others in the Narsinghpur circle, but that during these months no epidemic outbreak was reported. The first outbreak occurred in the Magli village, close to the railway line, 14 miles east of Narsinghpur. The outbreak was reported on the 18th March, but the disease had been present in the village for a fortnight previously, and 37 cases and 25 deaths had occurred out of a population of 550." Again, it is stated that "on the 21st January a woman was attacked with cholera in the town of Seoni, but recovered; with this exception, there was no appearance of cholera anywhere in the district till towards the end of February." Its reappearance is thus described :—

"On the 24th February 1869 a native traveller proceeding from Bombay to Nepal was seized with cholera at the Ganga stream, where it crosses the Great Northern Road, about 6 miles south of Seoni. . . . He died the following day. On the same day a coolie employed on the gangs under the Public Works Department, near Lakhnadaon, 45 miles north of the spot where the Nepal traveller fell ill, was seized and died; next day a man living in the village of Jamunia, close to the spot where the first case took place, was attacked. . . . Two other cases had occurred in the village."

In Nagpur city the first case of cholera in 1869 "was reported on the 20th February; on the 24th it appeared at Deolapur, on the Northern Road, 40 miles north of Nagpur; and about the same time a case occurred at the town of Maunda, the first stage on the Eastern Road." From these statements it would appear that the disease was more widely spread in the early part of the year than is shown in the annual returns.

However, be this as it may, during April and May cholera prevailed in all the districts of the province except Bhandara, Chanda, and Sambalpur, which were overtaken in the following month. The Sironcha district alone shows no sign of the presence of cholera throughout the year, so far as the annual returns are concerned; but in the Sanitary Commissioner's cholera history of the year, describing the course of the disease in the Upper Godavari district, he states, para. 415—"In the present year, on the 18th June, epidemic cholera again appeared at Bhadrachalam, after an absence of three years; the first persons attacked were a party of coolies employed in the bed of the river. This year again there was good reason for believing that the disease was brought up from Rajamandri (where it was reported to be very prevalent) by coolies coming up for employment. The epidemic soon spread to other gangs, and three or four villages were attacked; but the epidemic was very slight, and soon died out." In the province generally the epidemic culminated in different months in different districts, but in all, except six, had subsided in September, and completely disappeared in October. In the excepted districts, also, the disease ceased by November, except in Betul and Mandla, which each recorded three deaths in December. With these exceptions, there was no sign of the presence of cholera at the close of the year in any part of the province. The total number of deaths registered from cholera during the year 1869 is 57,079 against 7592 in the year before. In most of the districts the disease attained its maximum intensity during the south-west monsoon season, but in Nimar it culminated during March and April. In Betul and Mandla the disease showed greater persistence than in any other districts. The year 1869 began with 70 cholera deaths registered in January, and ended with 6 in December.

The rainfall of 1869, compared with the exceptionally light fall of the year before, was abundantly copious, being 49.42 inches against 31.44 inches respectively; it was also well above the average fall for these provinces, but was somewhat unseasonably distributed, the first and second quarters getting a scanty fall, and the third and fourth unusually abundant falls. Food was at famine rates throughout the year, and in many districts the distress was very severe.

1870.—In this year cholera abated in a remarkable degree from the intensity of its prevalence in the year before. Only 107 deaths from the disease were registered throughout the year against 57,079 in the year before, and the death-rate among the civil population fell to 0.01 from 8.30 respectively. Of the 107 deaths registered among the civil population, 96 occurred during the three months of June, July, and August; 56 of the number in

Hoshangabad district, and 32 in that of Sironcha. The others occurred in ones and twos during the first nine months of the year, excepting February and May, in which months there was no cholera mortality recorded in any part of the province. In September cholera entirely ceased activity, and there was no report of the presence of the disease during the rest of the year. Of the 21 districts, 9 only recorded cholera in 1870, and in 4 of these single deaths only were reported.

In March, however, there was a rather sharp outbreak of cholera in the Kawarda Zamindari, a dependency of Bilaspur, and not under registration. The particulars recorded in respect to this outbreak are to the effect that "cholera broke out in the village of Neorgam, of Kawarda, on the 20th March; that it spread to 10 villages, having a total population of about 9906 souls, and attacked 110 persons, of whom 69 died. The outbreak is said to have lasted twenty-seven days, and then stopped." Another outbreak occurred about the same time in the Mungeli subdivision. "It broke out on the 19th March in the village of Gangadwari, and lasted till the 28th, carrying off 9 persons out a population of 358. It did not spread, and has not been heard of in this district or in Kawarda since."

On the 23d April a death, reported to have been from cholera, occurred in the civil station of Saugor; but, as no other cases followed, the fact of the disease having been true cholera appears to have been doubted, and it was not registered as such. "The attack was said to have been brought on by the patient having eaten largely of unripe sugar-cane and mangoes." On the 18th May a fatal case of cholera occurred in the Jubbulpore Jail, and on the 8th June there were two other cases of cholera, which both recovered. Besides the above cholera deaths, which do not appear in the annual returns, there were several others also, almost all sporadic cases, occurring here and there at long intervals. It is recorded that there were indications of the presence of cholera among the population of Nagpur in the latter part of the monsoon season. On the 5th August a resident of the city was admitted into hospital at 2 P.M. suffering from cholera, and died the next day. On the 23d a Bannia, living in the Takli bazar, was attacked, but recovered. On the 4th, 7th, and 10th of September cases occurred in the city, one on each day, but these also recovered. Between the 14th and 24th September seven cases were admitted into hospital in the Central Jail, "which presented all the symptoms of cholera, though none proved fatal." In the latter part of September also a case—a case which was pronounced to be cholera by the civil medical officer—occurred in the civil station of Chhindwara. "We find, then, that although cholera made itself little manifest among the population, it was not absent from the province. We find, too, that although faintly shown, the general features of the epidemic resembled those of previous years. The period from March to September comprises the season during which, in former epidemics, cholera has risen to its maximum, and again fallen to its minimum; and we find that all the manifestations of the disease above described took place within that period." The rainfall of 1870 was abundant, somewhat more than that of the preceding year, and seasonably distributed, each of the several quarters receiving a due share of the general fall. There was a marked improvement also in the prices of food, although rates still held very high.

1871.—Cholera in this year sank into almost complete abeyance in these provinces, only 19 deaths from the disease being registered among the civil population during the whole period, and giving a merely nominal death-rate. Of the 19 deaths registered among the civil population, 7 occurred in

the western portion of the Nerbudda country, 2 in Burhanpur, 9 in the Nagpur country, and 1 in Sambalpur, the most eastern district of the province; 12 of the 19 were registered in the months from April to August, and 7 in the month of December. No death from cholera was registered during the first three months of 1871 in any part of the province, nor during the three months preceding December; but the occurrence in that month of 5 deaths at Hoshangabad and 2 at Nagpur indicate a tendency to renewed activity of the disease in those localities at the close of the year.

Besides the deaths registered, it appears that numerous cases of cholera, mostly sporadic, were reported, some of which recovered and some of which died. Thus it is recorded that the first case of cholera reported occurred in the city of Nagpur on the 16th January. The man died in fifteen hours from the time that he was attacked. "It was said that he had surfeited himself on uncooked vegetables." The next case was reported on the 21st February from the district of Seoni. The man died on the 18th February. "On the day previous to his being taken ill he had been employed from early morning till night on a sugar-cane mill, staving off his hunger with draughts of the fresh juice of the sugar-cane and occasional handfuls of green wheat from an adjoining field; at night he returned home and ate a heavy meal, which consisted chiefly of fish. The next morning he felt ill, was puffed out and swollen, and did not go again to his sugar-press. A little after noon he was seized with vomiting and purging, from which he became very weak and faint, and died the following night." On the 24th of the same month the appearance of cholera was reported in a village 7 miles from the town of Hoshangabad. "A man who had attended a marriage-feast on the 21st, and returned on the evening of that day, was seized with symptoms of cholera during the night, and died before morning. Another man who had attended the same feast was seized with similar symptoms, but was well again the next day. A woman who, it was said, had been suffering from bowel complaint for some time died on the same day." On the 23d February a case presenting some of the symptoms of cholera occurred in the town of Hoshangabad; and there was another case of the same kind on the 4th March. "Both these cases recovered." On the 19th April the civil surgeon of Khandwa, in Nimar, reported—"Two cases of cholera have occurred at Khandwa, one yesterday, the other during the night." Both recovered. "Five similar cases had been attended in the earlier part of the month;" but only one of these cases, a woman aged 70, died. On the 5th May a case of cholera occurred at Sehore, in the Bhopal Battalion, and another in the same regiment on the 26th July; both these cases "passed into the stage of collapse, but both recovered."

On the 17th May a man who had arrived from Saugor a day or two previously died at the railway station of Jubbulpore. "The man complained of thirst all day yesterday," the report states, "and drank water found near the goods-shed. About midnight he complained of pain in the stomach, and had purging and vomiting. He appeared to have received no attention, and is reported to have died about three or four this morning.' On the 13th May "a Brahmin woman arrived at the village of Girur, in Wardha, from the adjoining district of Chanda, and died that evening under symptoms resembling those of cholera. The same evening three other women, residents of the village, were attacked with similar symptoms, but recovered. These women are said not to have held communication with the woman from Chanda." Again—"On the night of the 23d May a prisoner in the Nagpur Central Jail was attacked with cholera, and died the following day; he was

a resident of the city, and had been imprisoned for debt only the day before he was attacked with cholera. On the 31st a criminal prisoner was attacked; on the 1st June 2 other cases occurred, and another on the 2d; in all, 5 cases between the 23d May and the 2d June, of which 2 proved fatal." Again—"On the 24th May a man living in the village of Kurbi, 15 miles from Nagpur, on the Eastern Road, was seized with cholera, and died the same day. On the 30th May a case occurred in the Nagpur city, in the sixth division; on the 2d June 2 cases occurred in the first division, and there was another fatal case on the 4th June in the sixth division; in all, 4 cases occurred in the city between the 30th May and 4th June, 3 of which proved fatal. The rains set in between the 6th and 10th June, and no other cases of cholera were reported from the Nagpur country for some months." These deaths appear in the annual register.

Again, it is recorded that on the 16th July a man was attacked with symptoms of cholera in the small town of Ichapur, close to the border of the Khandesh district of the Bombay Province. "The man, a day or so previously, had been to the village of Hartla," in an adjoining circle of the Khandesh district, "where cholera was said to have been prevalent at that time." On the 25th July a resident of Burhanpur was attacked, and died the same day; and on the following day a woman, also a resident, was seized with the symptoms of cholera, but recovered. Both these cases were attended to by the native doctor in charge of the dispensary. A month later, on the 22d August, the sweeper attached to the dispensary "was attacked with cholera, and died the same day." Again we have—"On the 27th July a boy, five years of age, died of cholera in the railway train between Ravere and Burhanpur. The mother of the child, with three other children, was on her way from a village near Poona to join her husband at Khandwa. They had passed the night of the 26th and 27th in the serai of the railway station at Bhosawal, and here the child was seized with vomiting and purging; they came on by train in the morning, but the child died shortly before reaching Burhanpur. On the 12th August a man and child of the Dher caste were seized with cholera at the village of Boregaon, on the road from Burhanpur to Khandwa." A child of the Bannia caste, living in the same village, was attacked on the following day. A child, four years of age, was reported to have died of cholera in a village in the Ashti circle of the Wardha district on the 28th instant; "but on inquiry there appeared to have been no good reason for registering the death under the head of cholera. No more cases of cholera were reported from any locality till December, when a report was received of a singular outbreak of cholera, or of disease resembling cholera, at a small village, consisting of about fifteen houses, in the Bori circle of the Nagpur district." The Police Report states that on the 26th November a girl of the Dher caste had fever, and in the evening of that day was seized with vomiting and purging. She was purged four times and vomited twice, and at daybreak of the 27th she died. That morning a Gond woman, aged 50, was seized with the same symptoms, and died at noon. In the course of that day and the following morning fifteen other persons suffered in the same way. . . . They all recovered. These two deaths appear in the annual statement as registered in December. On the 30th December a report was received that cholera had appeared in the town of Harda, in the most westerly subdivision of Hoshangabad district; but as the disease became epidemic in the town in January and February, and apparently spread from thence to other groups of population in that locality, the cases that occurred in the last few days of 1871 more properly belong to the cholera

of 1872, and the account of the outbreak will be given in the report for that year.

The above instances of the presence of cholera in the Central Provinces prove that the disease was more widely spread over the districts in 1871 than is shown by the death returns of the year. They are of interest also as illustrating the manifestations of the disease during a year in which it does not prevail epidemically. The same kind of manifestations of cholera have only to be multiplied to exhibit exactly the circumstances that characterise the deportment of the disease when it assumes epidemic activity. With reference to the outbreak of cholera in the town of Harda above mentioned, it is stated that the disease appeared "on the 26th December at the railway station of Harda, within a few days of the date on which it broke out in the same locality in 1869."

The rainfall of 1871 was somewhat less than that of the year before, but it was fully up to and slightly above the average fall. It was also seasonably distributed, except in the last quarter of the year, in which the fall was very slight. There was a continuous improvement in the prices of food, the average price of wheat in 1871 being 26.48 sers the rupee against 17.66 sers in 1870 and 12.66 sers in 1869.

1872.—Cholera in this year started upon a fresh course of renewed epidemic activity, although with nothing like the virulent severity which characterised the revived activity of the disease in 1869, the corresponding year of the preceding triennial cycle. The death-rate of the year among the troops and jails rose to 1.13 per mille of strength from 0.25 in the year before, and among the civil population to 0.22 from a merely nominal rate respectively. Out of the 21 districts in the province, only 9 recorded cholera in this year, the total of deaths registered being 1592 against 19 in the year before.

In 1871, as we have seen, 7 out of the 19 cholera deaths registered in that year occurred in the month of December, viz., 5 in the Hoshangabad and 2 in the Nagpur district. In the latter the disease appears to have ceased entirely at the close of 1871, no death from cholera being reported during the first four months of 1872. In Hoshangabad it was otherwise. The outbreak of cholera which occurred at Harda on the 26th December 1871 was continued on into the next year, and the cholera of 1872 in the Central Provinces begins with the disease active in Harda alone in the whole province, all the other districts remaining free of the disease until the month of March. In this month, whilst cholera ceased in Hoshangabad, it broke out with some violence in Nimar, and appeared also in Burhanpur districts. In April cholera was confined to these two districts, a solitary death only being reported from Narsinghpur. In May the disease commenced activity in Jubbulpore and Nagpur; and in June, whilst still active in these four districts, recommenced activity in Hoshangabad. In July cholera continued prevalent in all the previously affected districts, and appeared also in Damoh. In August it ceased in Damoh, Burhanpur, and Nagpur, and broke out in a burst in Wardha. In September cholera ceased activity in Wardha, Nimar, and Jubbulpore, and in October in Hoshangabad also; whilst in Narsinghpur the disease continued till November, when it ceased there also. In December cholera was reported from no part of the province, except seven deaths from Chanda, in which district the disease appeared for the first time in this month.

The history of this reappearance of cholera at Harda, after an absence of fifteen months from the place, is recorded as follows:—On the 26th December

1871 a woman residing in the Kolardha suburb of Harda, "who had been suffering from fever, but was then convalescent, went into the fields to work, was seized with purging and vomiting, and died within twenty-four hours. This woman was said not to have left the village for a long time previously." The second case reported occurred on the 29th December. The victim was one of a party of five labourers who had arrived at Harda on the 25th December from the district of Unao, in Oudh. "He was attacked about 5 A.M., got as far as the river, in which he eased and washed himself, then lay upon the edge of the stream, where it appears he lay all that day and following night, and becoming too weak to move or to help himself, was conveyed by his comrades to the hospital on the 30th, and there died. On the evening before his seizure he had taken merely his ordinary food."

"On the 30th December, at 2 A.M., an ahir (cowherd), a relative of the woman first attacked, and who had been to perform her funeral obsequies, was attacked in Kolardha, and died the same day. On the 30th, also, a kumar (potter), who had arrived from Allahabad two months before, and who had been living and working near the second case above mentioned, was also attacked. On the 31st there were four cases, one living and working at the same place as cases two and four—a man living in a garden on the opposite side of the river from Kolardha; a woman, wife of a railway workman, living in a hut between the kumar and the railway; and a little girl living in a hut adjacent to that occupied by the preceding case. On the 1st January four more cases occurred, —a prisoner in the lock-up, who had been working on the river-bank the day before; an Afghan, who had come to the fair with fruits, and resided in the town; a Marhatta, also living in the town; and a Madrasi woman, living near the wife of the railway workman above mentioned. Another suspicious death occurred on the 30th, but is not returned as cholera. A man had been suffering from fever for some days, was very weak, and became affected with dysentric symptoms on 28th; on 30th purging and vomiting came on, and he died the same day. A second case occurred at the lock-up on 2d January, but the man recovered. The disease was then chiefly confined to Harda proper and Kolardha, and there were daily cases till the 12th. On the 14th two cases occurred at Harda; on the 16th one; on the 25th one case beyond the hospital, to the north, near the nalah; and on 26th the last case for the time at Harda itself."

Cholera was subsequently brought to Harda four different times by travellers coming by train. On the 30th April a traveller from Mandla was removed from the train. On the 20th May one from the neighbourhood of Poona; on 8th June another man from Poona; and on 10th June a passenger from Khandwa. "All of these cases terminated fatally, but the disease did not spread." On the 16th October a tailor was attacked, and recovered. He had come from the Betul district, and arrived at Harda about a week before by rail from Itarsi, 10 miles from Raipur, "where cholera was raging at that time." The man "attributed the seizure to bathing and drinking the river water." Between the 16th and 25th October eight cases and three deaths occurred, and then the disease stopped.

"Contemporaneously with the first appearance of cholera at Harda on the 26th December 1871, the disease appeared near Bhamangaon, a village of 483 inhabitants, on the old cart road from Babai to Seoni and Harda, 2½ miles to the west of the Hoshangabad-Itarsi road, and about 4 miles N.N.W. of the railway station at the latter place, near the bank of the Luttundeo nalah, which falls into the Hathura River about half a mile distant, and has one well which supplies nearly all the year. The nalah dries up in May, and in December there is generally a fair stream; but it appears to have been low at this time."

There were, writes Dr. Townsend, about 300 coolies encamped on the bank of the stream some distance behind the village. They were living in huts and drawing their water-supply from the nalah, from the same points as those used for watering the cattle; and they are described as "huddled together without any kind of attention to sanitation," and "being chiefly strangers to the place, little communication was held with the neighbouring

villagers, who drew their water from the well on the opposite side of the village." Regarding the appearance of cholera among them, it is stated that "on 26th December 1871 a traveller from the Seoni direction, *i.e.*, on the Harda side, reached the place suffering from cholera, lay down in the coolie encampment, and died." No other case occurred till the 3d January, when a coolie was attacked, and died the same day. He was one of a gang of 50 who had just arrived from Harda. On the 3d, 4th, and 5th there were 9 cases and 6 deaths. The gang was then dispersed on the 4th or 5th, and up to the 7th there had been 11 cases and 8 deaths. On the 8th January the civil surgeon visited the spot, and found about 25 remaining. These he advised to leave, and then set fire to the encampment. Of the dispersed coolies, some went to Sonaswari, 2½ miles nearer Itarsi, where two of the number died; others went directly east to Babai and beyond; but no cases of cholera were known to have occurred east of the Hoshangabad-Itarsi road, though some of the coolies were said to have stayed over twenty-four hours at the large village of Rasulpur, 4 miles from the infected encampment.

Following this account, the course of the disease is traced in detail through the several months in Dr. Townsend's cholera history of the year. A few illustrative extracts are here given summarised:—On the 2d January cholera appeared at Banspani, a small Kurku jungle village away from any line of road, and distant 18 miles from Harda, on the S.E., in the hill district. The water-supply is from holes in the sandy bed of a nalah. On the 1st January a woman came with her husband from Banspani to get spirits from the Government distillery at Kolardha. She was taken ill on her way back, but reached her village on the 2d, and died on the 3d. On the 4th nine cases occurred in the village, all of which proved fatal. The whole of the villagers then left, spreading themselves through other jungle villages; two others died, but the disease did not spread in the neighbourhood.

On the 27th January a man went from Harda to Assgaon, about 4 miles distant, and died there; and on the 30th, during the celebration of a marriage feast, four persons were seized with choleraic symptoms at Besoni Kalan, 5 miles to the north of the Seoni-Harda road. These attacks were attributed by the civil surgeon to a debauch only. The first attacked was a woman, who died on the 31st; on the 1st February one man died, and on the 2d another. The hospital assistant from Seoni went to the spot, and treated four people, who recovered.

The appearance of cholera in February at Itarsi, the station on the Great Indian Peninsula Railway for Hoshangabad to the north and Betul to the south, is thus described—

"On the 6th February a party of pilgrims were proceeding by mixed train from Poona towards Benares, and had of necessity slept at Harda the preceding night. One of their number was seized with cholera symptoms in the train, was removed at Itarsi, and managed to crawl to the serai, where he died on the 7th. On the 9th a man who had come four days before by rail from Jubbulpore, and was putting up at the serai, was attacked, and died on the 10th. On that day a woman living near the serai and railway station was attacked at 9 A.M., and died at 4 P.M. On the same day a Fakir, who had lived in the serai for two years, was also attacked, and started next day for Hoshangabad, where he arrived, but died on the 13th. Again, on the 13th February a traveller by rail from Jubbulpore put up for a time at the serai, and making towards Hoshangabad, was attacked on the road, and died at the village of Biora, about half-way between the two places. On the 14th two chamars from Adamgarh, a small village behind the Native Infantry lines at Hoshangabad, went to Itarsi, remained all night at the serai, were both attacked with cholera, but hastening back, got medical treatment, and recovered."

Now, as regards these two cases coming from the suburb of Hoshangabad, it is to be borne in mind that cholera, as we have already seen, was epidemically prevalent in the town of Hoshangabad during the whole of the month of February, and it is quite as likely that they took the disease with them to the serai as that they contracted it in the first instance at the serai. However, be this as it may, the report states that "the serai was now cleaned out, whitewashed, and partially disinfected; but on the 27th February two men going from Adamgarh" (again the same suburb of Hoshangabad) "remained for the night at the serai, were both attacked, and died. The serai was now closed, the floor of the huts dug up and relaid, and the whole place again whitewashed and disinfected; and on its being repeopled, it was found free from taint. Well-water was used at the serai, but owing to there being no parapet, dirty water could flow back." Regarding the disease at Adamgarh itself, it is recorded that on the 27th March a kumar, who had been working on Rajghat for some days, was attacked at Adamgarh, taken by his parents to Oondsa Khairi, but brought back in a dying condition in the evening; and on the following day (29th) the wife of a bharai (carpenter), on the outskirts of the village, was attacked; both cases were fatal. The village is on broken ground near to, but separated from Hoshangabad by a nalah. It is chiefly occupied by chamars (tanners), and has two wells—one for higher castes and one for chamars. "No explanation could be given of this last outbreak." Again, it is stated that on the 27th July two children died in the lines of the Madras Native Infantry Regiment at Hoshangabad from cholera; that on the 29th the father was attacked and died, and afterwards the mother died. "The disease was confined to one hut, and was attributed to eating some half-putrid fish." On the 26th August another Sepoy in the same lines was attacked, and died.

On the 7th September a virulent outbreak of cholera occurred at Jasulpur, 5 miles east of Hoshangabad. In nineteen days 46 were attacked and 19 died. The village is on high ground, on the southern side of the main road from Narsinghpur to Hoshangabad, supplied with water from two pakka and one kacha well on or near the road. On the south-east, distant about a quarter of a mile and above the level of the road, is a small tank or pond. At the time of the outbreak "the place was in a very filthy condition." There is no history of importation; and the first case was that of a Kurmi girl, living in one of four huts on the outskirts of the village towards the pond alluded to; and the disease was confined chiefly to that side of the village, four cases occurring in the three other huts of the block, and others in opposite and contiguous houses, only three or four cases occurring on the north-western side. A large number of Kurmi women had been bathing and performing puja in the tank, which then contained about 3 feet of water, and was half covered by reeds and vegetation. It was commonly used for watering cattle and for bathing. The same night one woman and two girls were attacked, and the girl who was first seized died before morning. On the following day 13 were attacked, of whom 7 died. Five died on the 9th, and it is said 2 died within an hour of seizure. On the morning of the 12th 9 fresh cases and 7 deaths had occurred. A cordon of police was placed round the village to prevent communication with others, and a portion of the traffic was diverted *via* Raipur; on the 17th this cordon was withdrawn at the recommendation of the civil surgeon, but the disease remained in the village till the 26th.

On the day cholera ceased at Jasulpur a case was reported at Raipur, about a mile distant to the northward; and the disease remained up till 19th October, when there had been 35 cases and 19 deaths. Raipur is a large

irregular village on the bank of the Tawa River, off the main road, but with most of the traffic passing through when diverted at Jasulpur. When inspected on 2d February the place was very dirty and foul. There are a number of deep ravines leading towards the river; these were more or less filled with rubbish and fouled with human excretions, especially a large ravine in the Kumar quarter. There are several wells with water from 25 to 27 feet from the surface and about 5 feet deep, but the main supply is from the river and a nalah running into it. On the outside of the village, between it and Jasulpur, is a shallow tank, the bed of which was "found very foul indeed," as also the ground between it and the village. It was on this side the first and other early cases occurred, and the ground close to the house of the first attacked was very foul and near a foul ravine. At all times there is free communication with Hoshangabad, 3 miles distant; "but it is not known that there had been direct communication with persons first attacked, though this is quite possible."

On or about 21st September there was an outbreak of cholera at Sahelwara, on the Nerbudda River, about 16 miles north-east of Sohagpur, and quite away from any main line of traffic. In about fifteen days 26 were attacked, and only 4 recovered. "The place was in a very dirty condition at the time of outbreak." The village contains about 177 houses and 990 inhabitants, on the high alluvial bank of the Nerbudda River, without wells. On the south-western edge of the village is a deep ravine, used largely as a latrine, and very foul; and chamars have a tannery on the edge of the bank, near the centre of the village, the ground about being very offensive. "A good deal of rubbish collected within the village limits, and dead bodies thrown into the Nerbudda unburnt." The first attacked was a man living on the confines of the village. He had been to the village of Kundraj, about 2 miles distant across the Nerbudda, in the Bhopal territory, to purchase wheat. Cholera was present in the village at the time, 11 cases and 7 deaths having occurred in the week from 10th to 17th September. Following this first case, four or five days later, there was a death from cholera on the 26th, another on the 28th, and on the 29th there were 3 others attacked, of whom 1 died, and on 1st October 3 other deaths. On 2d October there were 6 cases, then an interval of three or four days, and then 9 were attacked within two days. "The disease did not spread to any of the neighbouring villages."

The foregoing accounts of the local manifestations of cholera in different parts of the Hoshangabad district and adjoining tracts during 1872 serve very well to illustrate the ordinary behaviour and surrounding circumstances of the disease in most parts of India in seasons of its epidemic prevalence generally.

The rainfall of 1872 was abundant; it exceeded that of 1871 by about 4 inches, and was 5 inches more than the average fall for the province. It fell mostly during the second and third quarters, but gave also a proportionately fair fall in the fourth quarter. In the first quarter the fall was scanty. Food prices ranged slightly higher than the rates holding in the preceding year, and without being cheap, indicate no general pressure from scarcity of food.

1873.—In this year cholera abated very sensibly from its rate of prevalence in the year before. Among the civil population the total of deaths registered was 344 against 1592 respectively, and the death-rate fell to 0.05 from 0.22 in 1872. The cholera of 1873 in the Central Provinces prevailed as an epidemic only in the Mahanadi division, and even there its prevalence was confined almost entirely to the district of Sambalpur (see Table No. I.) Of the 344 deaths registered during the year, 309 were returned from Sam-

balpur, and 20 from the adjoining district of Bilaspur. Of the other 15 deaths, 10 were registered in Nimar district, 2 in Jubbulpore, and single deaths each in Hoshangabad, Chanda, and Raipur. During the four months May to August inclusive no cholera death was registered in any part of the province; and during the succeeding four months ending the year, only 4 cholera deaths were registered in September, all in Sambalpur, 7 in October, again all in Sambalpur, save a single death in Jubbulpore, and 10 in November, all in Nimar. In December no death from cholera was registered anywhere in the province. It may be said, in fact, that the cholera of 1873 in these provinces prevailed only during the months of February, March, and April, and was confined mostly to the districts of Sambalpur and Bilaspur.

The district of Sambalpur, in common with the rest of the eastern portion of the province, had experienced complete immunity from cholera since the great epidemic visitation in 1869, that is, for a period of three full years, when in February 1873 it reappeared with an outbreak of the disease in the right wing of the 31st Regiment, Madras Native Infantry, at Sonepur, the chief town of a Feudatory State on the confines of the Sambalpur Khalsa, whilst on the march from Berhampur to Raipur.

The first case in the regiment is stated to have occurred at Sonepur, in the beginning of the Sambalpur district, and the last at Sakra, where that district terminates. The troops marched "the whole way along a pilgrim route," first through Berhampur to Khurdah, which is only about 20 miles from Jaganath. "This is the road by which cholera is annually brought into the Madras Presidency." Secondly, continues Dr. Townsend's report, from Khurdah to Raipur is the common highway by which pilgrims from the Central Provinces and countries to the north pass to Jaganath. "Beyond Khurdah long files of these people, with pale, anxious, half-starved faces, were met daily on their way to Jaganath. In two days we calculated that 1000 thus passed; a very small percentage was seen to return. They die on the road, we were credibly informed, like rotten sheep, frequently from cholera. From a little beyond Khurdah to Sonepur, that is to say, in the Native States, there is scarcely an available encamping ground which does not show signs of having been occupied either by pilgrims or Banjarris (trading gipsies)." On the first day, the report says, of the outbreak ten persons, with apparently no means of communication with each other, were attacked. They had not encamped together, did not even speak to each other; one was a Gosha (pardah, or secluded) woman, and most of them did not visit the town. "The disease could not, therefore, have arisen from personal communication; neither could it have been from the food, as they ate no particular kind of food in common, except what was consumed by hundreds. Individual members of families were attacked; two children of a widow were seized, while the mother escaped; a Gosha woman fell a victim, though her husband and family were not attacked; about the strongest man in the regiment was one of the first sufferers. The water used was from one tank, and seemed of good quality; it was drunk by everybody in camp, and no other water used." The strength of the wing was, Native officers and rank and file, 350; women and children, 765; followers, 280; total, 1395. The disease continued with the wing during ten marches, and in that time 81 cases were admitted into hospital, of whom 31 died. "The women and children suffered in the greatest proportion."

The left wing, it is recorded, had been stationed at Sambalpur, and left that station for Raipur on the 7th February. It followed the main road to Raipur, but was some days in advance of the right wing. "Not a single

case of cholera occurred during the march among the men or their families." After leaving Sonepur town, the first four marches of the right wing lay through the Feudatory State of Sonepur and the Zamindari of Barpaili. It was ascertained by the Deputy Commissioner that at Sonepur the first case of cholera occurred the day after the regiment left. At Binka, Rampur, and Barpaili, three of the four places at which the regiment encamped after leaving Sonepur, cases occurred very soon afterwards. On the 12th the regiment encamped at Panimora, which is within the Khalsa. The first cases of cholera reported in the Khalsa occurred on the 15th February in the villages of Panimora and Basanmora, and in the Sadar town. "The first person attacked in Panimora was a woman who is reported to have mixed with the camp-followers; five other persons subsequently suffered, all of whom were said to have held communication with the regiment. The case that occurred at the same time in the adjoining village of Basanmora was a resident who had gone with supplies to the regiment at Panimora." With regard to the first cases that occurred in the Sadar town, three persons were admitted as patients at the dispensary suffering from cholera on the 15th; one was a girl belonging to a gang of wandering thieves, who had been brought in from the northern part of the district a few days previously by the police; the other two were inhabitants of a suburb occupied by low castes. "As regards these cases, no evidence of communication is advanced. Pilgrims, however, were at this time returning from Puri; and some days previously cholera had broken out at Binka, in the Sonepur State, where the regiment had encamped on the 8th, and between this town and the Sadar there is constant communication." It is stated that "numerous instances are given in the Police Reports where the first case of cholera in a village was either a pilgrim or a resident who had visited a village in which cholera had previously appeared."

The Sambalpur Khalsa is divided into six registration circles; two of these are traversed by the pilgrim route and main road above mentioned. Of 51 villages from which 299 cholera deaths were reported in February, March, and April, 42 lie in the two circles of Barhgarh and Sohela, traversed by the pilgrim route and main road, and in these 42 villages 274 of the 299 deaths occurred. "Moreover, the epidemic was confined in these circles to the villages in the neighbourhood of the above roads. From the villages to the south of the pilgrim route . . . no cholera was reported; and from the villages to the north of the main road . . . only 2 deaths from one village were reported." The Police Reports furnished information regarding the first cases that occurred in 44 of 51 villages. In 17 of these 44 single cases of cholera only occurred; the disease did not spread. Of these 17 cases, 15 were travellers, or were residents who had visited other villages in which cholera was present. Of 27 villages in which more than 1 case of cholera occurred, the first person attacked was in 21 instances a traveller or a resident who, having been absent from home, returned suffering from cholera, or was attacked shortly after return. Thus in 36 of 44 villages from which information on the subject was obtained the first person attacked with cholera had arrived from elsewhere. Of these 36 persons, 12 were pilgrims; 5 had either furnished supplies to the regiment or in some way held communication with it; the remainder were persons belonging to the several villages.

After traversing the Sambalpur Khalsa, the main road enters the Phuljhar State, a wide tract of hill and jungle, with a population of only 37 to the square mile, extending as far as the Jonk River, which forms the boundary

between Sambalpur territory and the district of Raipur; and it was at Sankra, on the Jonk, on the 19th February, that the last case of cholera occurred in the regiment. The epidemic had thus continued with the regiment for twelve days, while marching a distance of 100 miles, half of which lay through open and populous country, and the remainder through hill and jungle. After crossing the Jonk River the route continues through another 40 miles of unbroken jungle, when it reaches the Mahanadi; crossing the river near the town of Arung, the road enters upon the open country of the Raipur district. The regiment encamped at Arung on the 25th, and arrived at Raipur on the 1st March. It is stated that several cases of cholera occurred in a village three marches from the Jonk River, after the regiment passed through; and "it is probable that other villages on the route (through the jungle tract) also suffered." Cholera appeared in the beginning of March in the small state of Kowria, immediately to the west of the Jonk, and between that river and the Mahanadi. In the latter part of March three cases of cholera occurred in the town of Arung; on the 22d of that month a Custom's peon, a native of Sankra, and employed in preventing the smuggling of salt on the road between Sankra and Arung, was attacked with cholera at the latter place; on the 24th a woman of the same place was attacked; and on the 27th there was a third case, also a female, resident of Arung. "These two women are said not to have held communication with the peon who was first attacked. The regiment had passed through on the 26th February, and it had been free of cholera for a week previously." A month later an outbreak of cholera appears to have occurred some distance farther on on this route. In the week ending 26th April 7 cases and 3 deaths were reported from the village of Khairi, and 3 cases and 1 death from the village of Pendra, both villages in the Bilaspur district.

It is recorded that there was nothing remarkable in the state of the weather previous to or at the time of this outbreak. It is stated, however, that—

"The mean temperature of the month of January was nearly 2° lower than the mean for the corresponding months of the previous years; that for February was 1.5° to 2.0° above the average; but the temperature for March was as much below the average as that for February was above the mean of previous years. No rain fell in January or February, but slight showers occurred on the 4th and 5th March, and a fall of 1.30 inch on the 6th."

In September there was again a slight reappearance of cholera in the district of Sambalpur. The first cases occurred in the village of Brahman Toorum, which is situated on the river on the border of the district, and a short distance from Sonepur, and which appears to be a depot for salt brought up from Cuttack. Three deaths from cholera occurred in this village in the week ending 13th September; "the first person attacked is said to have been in communication with boatmen who had come from Cuttack." In the same week a woman of the neighbouring village of Thekipailli, who had been to Brahman Toorum to buy salt, was attacked with cholera, and died on her return home. In the following week four deaths from cholera occurred in the village of Burgaon, in the same neighbourhood, and here also the man first attacked had been to purchase salt in Brahman Toorum. In the beginning of October an outbreak occurred in a village in the south of the district—a part which had remained free during the epidemic of the spring. "In this case the man first attacked had been to Sonepur, and was taken ill on his return; eighty other persons died sub-

sequently. Cholera was reported present in Sonepur in the week ending 20th September.

Besides the cases of cholera above mentioned, and the deaths which appear in the returns, a remarkable series of cholera cases occurred in the station of Jubbulpore in August and September.

"The first case was that of Dr. W——, Inspector-General of Education in the Central Provinces. He left Jubbulpore on the 9th August, on a visit to the Hon. Mr. Justice J——, at Allahabad, returning again to Jubbulpore on the morning of the 13th. Early on the 14th he was seized with symptoms of cholera, and died on the following morning. When Dr. W—— left Allahabad to return to Jubbulpore, Mr. J—— left for Mirzapore; he also was seized with cholera after he arrived at Mirzapore, and died about the same time as Dr. W——. At first Dr. W—— would not believe that the symptoms from which he was suffering were those of cholera, and the civil surgeon, Dr. Rice, was not called to see him till late in the afternoon of the 14th; but as soon as Dr. Rice became aware that he had to deal with a case of cholera, he adopted every practicable precaution to prevent the communication of the disease to others. Disinfectants were freely used, and the excreta carefully disposed of. After the patient's death the house was fumigated, the bedding used by him and his clothes were burnt; also the clothes of the servants who attended him."

No other case of cholera followed immediately; but on the 12th September, twenty-eight days after Dr. W—— was attacked, Mr. R——, the Inspector of Schools, was seized.

"On the 13th August, after he arrived at Jubbulpore from Allahabad, and again on the morning of the 14th, after premonitory symptoms of cholera had appeared, Dr. W—— was engaged for several hours in inspecting schools, and in this work was accompanied by Mr. R——. A box of office records, also, on which he had been engaged while in the first stage of cholera, was transferred to Mr. R——'s office." In the interval, continues the report, between the date of Dr. W——'s death and the day on which Mr. R—— was seized with cholera, he had been on a tour of inspection in the Saugor district; "but there had been no cholera in Saugor, nor indeed anywhere in that part of the country." Mr. R—— returned from his tour on the 2d September, and went to reside in the hotel. The hotel is near the house in which Dr. W—— died. Mr. R—— was not in good health; he had been much exposed to weather when on tour, and on the day previous to that on which he was seized with cholera he had applied to Dr. Rice for treatment for symptoms of gout. On the 14th September, in the afternoon, or about forty-two hours after the first symptoms appeared in Mr. R——, the assistant-manager of the hotel, Mr. B——, who slept in a room immediately below that occupied by Mr. R——, was seized with cholera; he had been subject to diarrhœa at intervals for the previous three months. Both patients died.

Great precautions were taken, as in the previous case, under the supervision of Dr. Rice, to prevent the spread of the disease, and no case occurred subsequently in or near the hotel. After an interval of some days, however, cases of cholera occurred almost simultaneously among the railway employees and among the soldiers of the European regiment in the barracks.

The first of these cases was a fireman named Murray, occupying a house in the Great Indian Peninsula Railway lines (not far from the railway station), and employed on working the trains between Jubbulpore and Sohagpur. On the morning of the 25th he took the morning train from Jubbulpore to Sohagpur, left that station in the following morning (the 26th) to return to Jubbulpore, but was taken ill at Gadarwara, and sent back thence to Sohagpur, where he died in the morning of the 28th. Early in the morning of the 27th an engine-fitter named Hogan, occupying the same house with Murray, was seized with severe cholera, but he ultimately recovered. On the 26th a soldier of the 2–25th King's Own Borderers, living in the barracks, was attacked. On the 27th three more cases occurred in the regiment, and on the 28th the surgeon with the regiment was attacked. There was at the time free intercourse between the soldiers and the railway men; for Dr. Rice, on visiting Hogan the day that the latter was seized with cholera, found three or four men of the regiment in the house anxious to remain in attendance; but whether any of these men were subsequently sufferers could not be ascertained. On

the 4th October a carriage-fitter named Mutton was attacked. He lived in the railway lines, two houses intervening between his and the one occupied by Hogan and Murray. The latter house was supplied with water by means of pipes from a well near the engine-shed. Mutton used water drawn from a well near. Dr. Rice reported the house occupied by Hogan and Murray to be in a dirty state; but, excepting this, there was no other condition that was not common to the other bungalows in the same lines. There was another fatal case in the European regiment about this time. The regimental barracks are at some distance from the railway lines.

On the 12th October a woman, the wife of a water-carrier living in the New Infantry lines, was brought to hospital in a state of collapse. There had been a feast in the regiment, and all the cooked rice remaining over had been given to the water-carrier. The wife and a female relation residing in the house had been living on the stale rice for four days, when the wife was seized with symptoms resembling those of cholera. She aborted the day after admission into hospital, and died from exhaustion on the 16th. "With this exception, which is a rather doubtful one, there was no cholera among the Native population of the town and cantonment."

It is very remarkable, observes Dr. Townsend, that in July and August of the previous year, when there was a mild epidemic of cholera in the town of Jubbulpore, and a few cases occurred among the Native population of the cantonment, the Europeans escaped altogether; but in 1873, when the presence of cholera among the European population was manifest, the whole Native population of the town and district remained entirely free. Cholera was not reported during the year from any locality nearer Jubbulpore than Sahawal, a town in the Rewah territory, 4 miles west of the Satna railway station, and 120 miles north of Jubbulpore. An outbreak occurred there in the latter end of September, about the time that the cases among the European soldier sand railway men took place; but there is no evidence connecting the two outbreaks.

In the end of October there was a sharp outbreak of cholera in the Nimar district, in the village of Songir, half a mile off the main road from Indore to Bombay. The first case occurred on the 30th October, and in the course of the next ten days twenty cases were reported, of whom ten died. The population of the village was 509. "The water-supply, which is drawn from the River Abna, was reported bad."

The rainfall of the year 1873 was very deficient; it was less than that of the year before by 12 inches, and below the average by about 7 inches. In only two other years of our series, viz., 1864 and 1868, was a smaller fall registered. It was, however, seasonably distributed, except in the last quarter, in which the fall was very light. The price of wheat, the staple food-grain, remained at much the same rate as in the preceding year.

1874.—In this year cholera sank into still lower subsidence; only 14 deaths were registered among the civil population during the year, against 344 in the year before, giving a merely nominal death-rate. Of the 14 deaths registered, 12 occurred in the Sambalpur district towards the close of the year, in December; the other two occurred in the Mandla district, one each in June and July. In the singular immunity from cholera which characterises the triennial cycle 1872–74 the Central Provinces shared equally with the provinces of Berar, Bombay, and Madras, that is to say, with Southern India generally.

Of the two cholera deaths registered in Mandla, one was that of a police constable, who was seized with vomiting and purging while travelling on duty, and died after an illness of between two and three days. Regarding the other no particulars are recorded. In connection with the twelve deaths

registered in Sambalpur, it is recorded that "in August a few cases occurred at Sonepur, the chief town of a Feudatory State on the south-east border of the Sambalpur district; and in the end of November a rather singular outbreak occurred in the Kolabira Zamindari, in the extreme north of the same district, where it borders on the territory of Chhota Nagpur." Regarding the appearance of the disease at Sonepur, it is recorded that the cause of the outbreak was as follows:—

On learning of the existence of cholera at Cuttack, orders were given that no pilgrims coming from thence should be allowed to enter the town, but should be made to pass on by some other road. "These orders were enforced, and no pilgrims entered the town. In the meantime, however, a sweetmeat maker went by night and sold sweetmeats to some of the pilgrims who had been stopped outside the town. Having thus had communication with the pilgrims, he returned, was attacked with cholera, and died. This was the first case that occurred in Sonepur."

In Binka the following, it is stated, was the origin of the outbreak:—

A man, a weaver by trade, had gone to Patun to sell cloth; on the day that he returned to his home he was attacked with cholera, and died. In reference to this, it is noted that "a person going from Binka to Patun must of necessity pass the route by which the pilgrims from Puri were returning to their homes in the north-west." In Sonepur there were in all 20 deaths and in Binka 7 from cholera.

Regarding the Kolabira outbreak, it is recorded that the Zamindari forms part of a rather elevated plain extending between two ranges of hills which separate the valleys of the Mahanadi and Brahmini rivers; its elevation at the northern end is about 400 feet above Sambalpur, or 850 feet above sea-level. The plain generally is covered with jungle. There are, however, wide areas clear of jungle and cultivated; but from the sandy nature of the soil and the scarcity of water, cultivation is possible only in the rains, and rice forms almost the sole crop. The population is sparse, and the villages are far apart. The villages are for the most part situated on high dry ground, and nearly all are embedded in wide topes of mango, mohwa, pipal, and other trees, which grow to a large size in all parts of the plain. Some of the villages are large, but they are not crowded, being generally divided into several hamlets. The water-supply of the villages is derived altogether from tanks and streams—wells are almost unknown—and close to nearly all the villages there are one or more tanks. Some of these tanks are of large size, and retain a good supply of water all the year round; but the majority are small, and the water in them becomes scanty and impure in the hot weather. Almost all the tanks are double, that is, there is a band run across the middle, through which the water percolates from the higher into the lower; the latter, therefore, contains the purer water, and is reserved for domestic use; but in all the people bathe and wash their clothes at the same time that they draw their water for drinking. The plain is traversed by the road from Sambalpur to Ranchi, which is much used in the dry season by Banjaris carrying salt from Sambalpur to Sirgujah and other parts of Chhota Nagpur. In the Kolabira Zamindari, 43 miles north of Sambalpur, on the road to Ranchi, cholera first appeared in the village of Talmunda.

A fair, or gathering of between 2000 and 3000 persons from the country round, had been assembled at this village from the 19th to 25th November; and on the 29th the first case of cholera occurred. On that day the nephew of the village headman "was seized while cutting rice close to the village tank about mid-day, and died the following day. No more cases occurred till the 3d December, when the mother and sister of the first patient were seized. On the 5th another member

of the headman's family, and on the 6th four people of the village outside the headman's house, were attacked. The disease remained among the villagers till the 10th, and in this time 16 persons were carried off, of whom 7 belonged to the headman's family. But by this time the village had been deserted. On the 5th December the headman, taking his family, numbering 16 persons, fled to the village of Kalimura, 6 miles distant, and encamped by the Deo there. There, however, his two children, a boy and a girl, died; the family then divided into four parties, and fled in different directions, three to villages from 6 to 10 miles distant, and the fourth to the village of Purnapani, in Bamra. The headman's family was altogether four days in Kalimura. On the day they dispersed a case of cholera occurred in the village, another on the next day, and in the course of five or six days following the departure of the Talmunda headman's family six inhabitants of Kalimura died. In three of the villages to which the headman's family scattered themselves on leaving Kalimura no harm seems to have followed; but in Purnapani, in Bamra, cholera broke out, and a man flying from thence reached the village of Sudamal, in the Sambalpur district, and died there on the 26th December."

On the 7th December, the report continues, eleven villagers flying from Talmunda arrived at the village of Samasinga, in the Sambalpur district, in the afternoon, and were received in three houses in the village.

"None of them were apparently sick when they arrived, and none suffered subsequently." On the 11th a Gond girl, 7 years of age, was seized with cholera, and also an old woman who had been suffering from fever for some time previously. On the 12th 4 persons died, and on the 13th 2. There were then no more deaths till the 21st, when 2 persons died; and subsequently a child died who had been taken ill some days previously. Altogether, between the 11th and 28th December 17 persons (12 females and 5 males) were attacked, of whom 11 (8 females and 3 males) died.

Cholera, it is stated, had not been heard of anywhere in that part of the country prior to the outbreak at Talmunda, and, so far as can be ascertained, it did not subsequently appear in any villages, with the exception of the three above mentioned, in which persons flying from Talmunda had taken refuge; "in fact, cholera is not by any means common in that part of the district." The history of Talmunda, however, is peculiar.

Some years ago, when Sambalpur formed part of the Chhota Nagpur division, the village was on the road. There was a dâk bungalow there, and an encamping ground for troops; and the people were so much troubled in the matter of supplies that they removed their village half or three-quarters of a mile off the road, across a small stream. This move, however, did not prove fortunate. The villagers on the present site have suffered greatly from fevers at all seasons of the year; "and, worse than that, they have been subject to visitations of cholera every four or five years." The village itself is situated on high ground, near a hill which rises some 300 feet above it, but not sufficiently close to impede ventilation; the soil of the site is sandy and dry, and, with the exception that the rice-fields are rather more close to the village, Dr. Townsend could discover no great fault in the site, compared with other villages in the neighbourhood, to account for its reputed unhealthiness.

Of the 12 cholera deaths registered in Sambalpur district, 11 occurred in the village of Samasinga; the other was the fugitive from Purnapani who died at Sudamal. No cases of cholera occurred among the residents of this village. "The weather at the time of this slight outbreak of cholera was unusually cold, the temperature of the three weeks ending 28th November, 5th and 12th December, having been more than 4° below the average of former years. There had been no rain for nearly a month when the disease first appeared in Talmunda."

The rainfall of 1874 for the province generally was very abundant. It was about 14 inches more than that of the year before, and about 7 inches above the average. It fell almost entirely in the second and third quarters —the season of the south-west monsoon—the falls in the first and fourth

quarters together being less than 2 inches. Food also was more abundant in 1874 than in 1873, and there was a distinct improvement in prices, the average rate for wheat having fallen to 28.63 sers the rupee from 25.91 sers respectively.

1875.—In this year, the first of a new triennial cycle, cholera revived into fresh epidemic activity; the total of cholera deaths registered amounted to 14,643 against only 14 in the preceding year among the civil population, giving a death-rate of 1.97 per mille against a merely nominal rate in 1874.

The outbreak of cholera which appeared in the Sambalpur district towards the close of 1874, as we have seen, was confined to that locality and neighbouring tracts, and ceased before the end of the year. The year 1875 opened with no report of cholera from any part of the province during the month of January; but in February 7 deaths from the disease were registered in the Bilaspur district, adjoining that of Sambalpur, and these were the only cholera deaths registered in that month throughout the province. In March the disease appeared in Raipur, the adjoining district to Bilaspur, with 16 deaths registered; and at the same time increased in prevalence in Bilaspur, the deaths in the month amounting to 77 registered. No other part of the province recorded cholera in this month. In April there was a check to the progress of the disease both in Bilaspur and Raipur, in the former the deaths falling to 32, and in the latter no cholera death being registered. But whilst this check occurred in the Mahanadi districts, cholera commenced activity in the Nerbudda and Tapti districts, 10 deaths in April being recorded in Hoshangabad and 21 in Nimar; whilst a solitary death was reported in Jubbulpore also, and 13 in Burhanpur. In May cholera resumed activity in Bilaspur and Raipur, and rapidly acquired epidemic severity. In Bilaspur the disease culminated in June, and finally ceased in October; total deaths, 2525. In Raipur it prevailed with maximum intensity in July and August, and culminating in the latter month, gradually abated during the following months, but was still present at the close of the year, 34 deaths being registered in December, and a total of 4449 during the year. In Hoshangabad and Nimar the disease ran a steady epidemic course, prolonged to the close of the year, but at no time very violent, the deaths in December being 7 and 3 respectively, and the totals in the year 629 and 423. In Burhanpur cholera received a check in May, and no death was reported from the disease; but during that month it appeared in Betul with 12 deaths registered, in Murwara with 18, and in Balaghat with 2, whilst another single death was registered in Jubbulpore. In June cholera appeared in Narsinghpur with 15 deaths registered, and in Bhandara with 45, and recommenced activity in Burhanpur with 3; whilst in Betul it received a check, with no death registered, and in Murwara and Balaghat disappeared entirely, with 8 and 2 deaths respectively registered during the month. In July cholera recommenced activity in Betul; lulled in Bhandara, where the deaths fell to 4; progressed apace in the other affected districts; and appeared for the first time in Sambalpur, Nagpur, and Wardha, with 16, 60, and 31 deaths respectively registered in the month. In August cholera appeared in the Saugor, Mandla, Chhindwara, and Chanda districts, and attained its greatest intensity of the year, the epidemic culminating with 6224 deaths registered in this month in the whole province. In September the disease appeared in very mild prevalence in Jubbulpore, Seoni, and Sironcha, and was generally abating in most of the other districts in which it was still present; the provincial total of deaths registered fell to 2624, the number in July, before the sudden rise to the climax in August, being 2220. In

October the disease ceased entirely in the Sambalpur and Bilaspur districts, in Nagpur, Chhindwara, and Mandla, and in Narsinghpur, Jubbulpore, and Saugor. In November it ceased in Sironcha, Wardha, and Betul. In December all the districts were free of cholera, excepting five, viz., Raipur, which registered 34 deaths in that month, Chanda 9, Bhandara 5, Nimar 3, and Hoshangabad 7 respectively. The epidemic of the year began with 7 deaths registered in February, and the year closed with 58 in December.

Every district in the province, Damoh alone excepted, recorded cholera in this year; but the main prevalence of the disease was in the Mahanadi districts and those of the Wainganga division, and next in the Nerbudda and Tapti districts. In the Satpura districts the epidemic had no great force, and in the Vindhyan districts appeared in very mild force. The disease, though first appearing in February, commenced general activity only in April. In May the epidemic developed, and rapidly increasing in violence, culminated in August. The decline was as rapid as the rise, and the epidemic lost its force by November.

Regarding the meteorology of the year 1875, it is recorded—

"The temperature of the last two months of 1874 had been much below the average; in the early part of January it rose considerably, but it fell again about the middle of the month, and continued unusually low for the next three weeks, or until the end of the first week of February. The mean temperature of that week was 4.6° below the average; there was then a sudden rise in the temperature, and the mean in the following week was 1.7° above the average. The weather continued unusually warm for the next seven weeks, or until the end of March, the mean temperature of that month being 3° above the average. Slight showers that fell during the first days of April reduced the temperature to slightly below the average; but it rose again in the second week of the month, and continued high till the middle of May. The mean temperature of the week ending the 15th May, the hottest week of the year, was 95°, or 4° above the average for that week; during the three following weeks the air was cooled by frequent storms, and the temperature was below the average."

"The monsoon may be said to have set in during the week ending the 12th June, when rainfall was registered at 19 out of 21 rain-gauge stations; but the quantity was at first scanty, particularly over the districts north of the Satpuras, and the mean temperature during the second and third weeks of June was above the average. The mean temperature of the month of June was below the average south of the Satpuras, above the average at the northern stations. During July and August the temperature was at most stations slightly below the average; at Pachmarhi and Khandwa it was above the average. In September it was above the average in the southern districts, but slightly colder in the northern districts. During the months of October and November the mean temperature was below the average. In December also the weather was generally cool, but, compared with former years, the difference was not so great as in the preceding months."

Regarding humidity, it is stated—

"In January the relative humidity was generally below the average. In February it was above the average at all stations; but through the following three months it continued below the average at all observatories, with the exception of Jubbulpore and Chanda, where it was slightly above the average in March and April. In June also the humidity was below the average at all the stations north of the Satpuras, but equal to or above the average south of the range. During the subsequent months of the monsoon and in October the moisture of the atmosphere was generally above the average; in November and December the air was comparatively dry."

Regarding the prevalent winds, it is stated—

"The normal direction of the winds blowing over these provinces during the first five months of the year is northerly, with more or less deviation to the west and east. During January 1875 the deviation was more often to the west, in February to the east; during March and April and the first part of May the wind-directions were very constant from the north-west, corresponding in this respect with the directions observed in the same

months of 1874. Winds from the south-west became frequent in the latter part of May, but the monsoon did not set in till the second week of June. During the prevalence of the monsoon, winds from the north-west were more frequent than usual in July and August, less frequent in September. Through October, November, and December the prevailing wind was from the north-east, which is the normal direction at that season of the year."

Regarding the rainfall, it is stated—

"The average fall between the 1st January and the 1st June is 2.10 inches, and this is made up by thunder-showers pretty equally distributed over each month. In 1875 the average quantity measured at 21 stations during the five months was 1.25 inches, and a great part of this quantity fell in May. In March, with the exception of a slight shower at Sironcha, in the extreme south, on the 26th of the month, no rain fell over the whole province; and in April the mean fall measured at the 21 stations was only 0.10 of an inch. In many of the districts north of the Satpuras no rain fell either in March, April, or May. The monsoon rains commenced in the second week of June; in that week south-westerly winds, with heavy falls of rain, prevailed over the districts south and east of the Satpuras, but it was not till the following week that heavy rain fell on the northern districts. . . . The distribution of the rainfall was, in fact, remarkably unequal; for instance, at Narsinghpur the rainfall was 44 per cent., and at Hoshangabad 40 per cent. above the average of the nine preceding years; but at Jubbulpore, 50 miles to the east of Narsinghpur, and at Khandwa, the nearest station to the west of Hoshangabad, the rainfall was 16 and 11 per cent. respectively below the average. The greatest quantity measured during the monsoon at any one station was at Pachmarhi, where 101 inches fell; the least at Khandwa, where only 30 inches were measured. The greatest fall in twenty-four hours occurred at Narsinghpur on the 27th June, when 13 inches fell, and caused great damage to the Great Indian Peninsula Railway, in that neighbourhood. This heavy fall, however, was quite local; for at Jubbulpore little more than 1 inch was measured on the same date, and at Hoshangabad none. The rainfall was heavy and continuous through the five weeks from the 26th June to the 31st July; in August it was not above the average, but heavy falls occurred in September, and the quantity measured was above the average for the month. The monsoon ceased and the wind changed to the north in the last week of September; but on the third and fourth weeks of October rain fell generally over the province, and in many districts south of the Satpuras the fall was heavy. On the 23d 5.25 inches was measured at Wardha, a very unusual fall at that season of the year. In November no rainfall was registered, and the fall in December was limited to slight showers occurring in the beginning of the month on the Vindhyan and Satpura Hills. . . . The excessive temperature of March constituted the chief feature in which the meteorology of the early part of 1875 differed from that of the corresponding period of 1874. The rains of the monsoon were heavy and above the average in both years."

The rainfall of 1875 was the heaviest on record of any year in the whole of our series from 1863 to 1881 (see Table No. V.), excepting only that of 1867, the falls of the two years being 56.53 and 59.87 inches respectively, and in both years the excess fell mostly in their third quarters. The price of food in 1875 was remarkably cheap—cheaper than in any year since 1863.

1876.—Cholera, instead of abating in this year, as was due in the normal cyclical course, prevailed with considerably increased epidemic severity; the total of deaths by it registered among the civil population amounted to 20,124 against 14,643 in the year before, and the death-rate rose to 2.72 per mille from 1.97 respectively.

Of the five stations which showed cholera still present in December 1875, Chanda only shows the presence of the disease in January 1876; there was no report of cholera in any other part of the province in that month. In February there was no cholera death registered in Chanda, and the epidemic of the preceding year, it seems, finally ceased in the month before, when twelve deaths were registered; neither was any cholera reported in February from any other part of the province, excepting only the Sambalpur district, in which seven deaths were registered, the first reappearance of the disease in this

district since the end of the preceding October. With the exception of these deaths in Chanda and Sambalpur, the entire province was free of cholera during the first two months of 1876. In March, whilst the disease continued advancing gradually in Sambalpur, it broke out afresh with considerable violence in Chanda, and commenced an epidemic course in Jubbulpore, Hoshangabad, Mandla, and Betul, and a few cases occurred also in Balaghat. In April the districts of Seoni, Nagpur, and Raipur were overtaken, the last named very mildly, by the epidemic, and a few stray cases appeared also in Nimar. In May the districts of Saugor and Narsinghpur, and in June those of Damoh and Murwara, Wardha and Sironcha, were also invaded. In July the disease spread to Nimar and Bhandara, and in August to Chhindwara; and thus the whole province was covered by the epidemic, excepting the districts of Burhanpur and Sambalpur, which remained exempt throughout the year, only a single death being recorded in the latter in October. During July and August the epidemic prevailed at its maximum intensity, the total of deaths registered in each month being 5176 and 5062 respectively. In September the epidemic commenced to abate, and the deaths fell to 1234, the number in April being 1032. In October the deaths fell to 260, but in the next month the number rose again to 1076. This sudden rise was caused by a temporary revival of the abating epidemic in several districts of the Satpura and Wainganga divisions; thus in Bhandara the deaths rose to 230 in November from 13 in October, in Nagpur to 456 from 38, in Chanda to 76 from 1, and in Chhindwara to 83 from none respectively. In December, however, the mortality fell again as suddenly in all these districts, and the year closed with a total of 198 deaths registered in that month. All these deaths in December occurred in the districts of the Satpura, Wainganga, and Mahanadi divisions; but Mandla and Betul in the first, Sironcha in the second, and Bilaspur in the third recorded no cholera in that month. All the districts of the other three divisions were absolutely free of cholera during the last two months of the year.

The returns for the year 1876 show that the tendency of the cholera epidemic of the year was towards a long course and slow subsidence. In Chanda and Sambalpur the disease was more or less persistent throughout the year. Of the five districts overtaken in March, the disease endured till the month of October in Jubbulpore and Hoshangabad, and in Betul till November; whilst in Balaghat it reappeared in November, after the occurrence of three or four stray cases in March and April, and continued to the close of the year; but in Mandla it ceased by the end of August. Of the four districts affected in April, the disease continued to the close of the year without intermission in Seoni and Nagpur; in Nimar, after a lull during May and June, it reappeared in July, and continued to the end of October; and in Raipur, after ceasing entirely, with only a single death in June, it reappeared in December, with 12 deaths in that month. Of the six districts affected in May and June, however, only Wardha kept the disease to the close of the year. In all the others it ceased more rapidly—in Sironcha in August, in Narsinghpur and Murwara in September, and in Saugor and Damoh in October.

Meteorology.—The hot season was a trying one, owing to the high temperature, the dryness of the air, and the irregular way in which rain fell during the month of June. Consequent on the absence of rain during the early and later parts of the year, the relative humidity was very low. The chief features of the year, compared with the previous ones, are the low temperature at its opening and close, the prolonged hot weather, its abnormally high temperature, and the absence of rain during so many months.

Food, however, was abundant and very cheap—cheaper than in any other year of our series except 1862. To the favourable condition of the people in this respect may be attributed the comparative mildness of the cholera epidemic, abnormally excited into activity by the unfavourable meteorological conditions of the year.

1877.—Cholera in this year returned to its normal cyclical course of prevalence, and abated in a remarkable degree from the severity of its epidemic activity in the year before. The mortality from the disease among the civil population fell to 3418 from 20,124 in 1876, giving a death-rate of 0.46 against 2.72 per mille respectively.

Out of the 21 districts in the provinces, 12 were affected by cholera in 1877; in the other 9 districts there was no report of the disease throughout the year. In 8 of the 12 affected districts the cholera of 1877 was a continuation of the preceding year's epidemic; but in all the 8, excepting Chhindwara, where the disease broke out afresh in November, it had subsided, and ceased entirely by the end of October. In Chhindwara the only cholera deaths recorded in 1877 were 6 in January, 6 in February, and 22 in November; in Seoni, 8 in February and 15 in March; in Balaghat, 7 in January, and 23, 9, 41, 10, and 6 in each of the following months; the disease then finally ceased, no death being reported from July inclusive to the end of the year. In Bhandara the disease was more active, the deaths in January being 109, in February 118, in March 32, in April 76, in May 51, and in June 34, and then none till September, when a single death was recorded; in Nagpur the deaths were 2 in January, 9 in February, 41 in March, 4 in April, 1 in June, 2 in September, and 1 in October; in Wardha the epidemic of 1876 ceased in December of that year, and there was no reappearance of the disease throughout 1877; in Chanda only 5 deaths were registered in January, and no more during the rest of the year. In Raipur the reappearance of cholera in December 1876, after an absence of five months, was the commencement of a fresh epidemic there, which prevailed with considerable violence throughout the first nine months of 1877, and finally subsided in September, with a total of 1895 deaths registered. The deaths were distributed monthly as follows, viz.:—76 in January, and in each of the following months 78, 81, 119, 329, 800 (the climax attained in June), 370, 106, and 26 respectively. In the Sambalpur district the deaths were 43 in February, 110 in March, and 19 in April; then, after an interval of four months, 3 in September and 8 in October, and no more in this year. In the other four districts affected the deaths registered were as follows, viz.:—In Bilaspur, 18 in February, 52 in June, and no more in this year. In Upper Godavari (Sironcha) cholera first appeared in June, with 50 deaths registered in that month; the disease then ran a mild epidemic course through the following months, and finally ceased with 5 deaths in November, the total of the year being 169. In Saugor and Narsinghpur, omitting a solitary death recorded in July in the former, cholera did not appear until October; the disease then ran a short and sharp course, and ceased entirely by the end of November.

The other nine districts remained absolutely free of cholera throughout the year. In December there was no sign of the presence of cholera in any part of the provinces. The year 1877 began with 205 cholera deaths in January, and ended with none in December, the number in November being 103. The year 1876 began with 7 cholera deaths in January, and ended with 198 in December.

The meteorological conditions of the year 1877 were, it is recorded, "just

the reverse of those of 1876." The year was ushered in with a low temperature, which was almost universal throughout the provinces; the heat of the spring and summer months up to the setting in of the rains was tempered by occasional showers; whilst during the rainy season, and especially during the latter months of the year, the temperature remained steadily above the average of previous years. Such, in brief outline, are the main features in regard to temperature.

The price of food in this year rose rapidly to famine rates. The cheapness of the preceding year continued during the first months of 1877, but then, owing to the large exportations of the food-grains to the famine districts of Madras, the prices suddenly rose to very high rates. The average price of wheat in 1877 was 14.60 sers the rupee against 34.22 sers the rupee in 1876. To this unfavourable condition may be attributed the somewhat severe prevalence of cholera in 1877, as the third year—a year of cholera abeyance—of the triennial cycle beginning with 1875. Although the average rates of wheat in 1876 were unusually cheap for the province as a whole, still in some districts, owing to short crops and the effects of a commencing exportation of the grain in the country, there was more or less of pressure felt from local high prices. These prices, however, mainly affected the labouring and other classes dependent upon the markets for their food; the agricultural classes would still fare fairly well, so long as their grain-stores were not exhausted, and of this calamity there was no sign during 1877.

1878.—In this year, the first of a new triennial cycle, cholera prevailed with revived epidemic activity, and acquired considerable virulence. The number of deaths registered among the civil population was 40,985 against 3418 in the year before, and the death-rate 5.53 against 0.46 per mille respectively.

The manifestations of cholera in 1877, as we have seen, were confined to the southern and eastern districts, excepting only some unimportant and isolated outbreaks in Saugor and Narsinghpur; and nowhere did the disease prevail with any great epidemic violence, except in Raipur, in which district alone more than half the entire registered mortality of the year occurred. The general tendency of cholera in 1877 was to complete subsidence, and the year closed without a sign of the presence of cholera in any part of the provinces in December. The year 1878 also opened without a sign of cholera anywhere during January. The first cholera deaths of the year were registered in February, in the district of Hoshangabad, a district from which no cholera had been reported during the preceding fifteen months.

The appearance of the disease is thus related—

"On the 2d February a case occurred at Mandla, a village on the western border of the district, close to the railway, and on the Machak River; eight cases occurred here in rapid succession. The disease then ceased in the village, and did not reappear until the 14th May, when nine cases occurred."

The next appearance of cholera was in the same month, in the adjoining district of Betul, with 4 deaths registered in March, and in Nimar, with 10 deaths also registered in March. In Dr. Townsend's history of the epidemic, the disease, it is stated, appeared in the Betul district on the 25th February, in the village of Gorpur, on the western border, adjoining Hoshangabad, and on the Gangal River; the disease here lasted eighteen days, and attacked 16 persons in all, of whom 4 died. Of the 10 deaths at Nimar, 6 occurred among an assemblage of devotees at the Unkarji temple at Mandhatta, and another in a traveller. The proceedings of the devotees the medical officer

describes as a "debauch." Regarding the appearance of the disease in the Nimar district, it is related that—

"On the 11th three cartmen were returning to Khandwa from Indore, where it is said cholera existed. One was attacked, and died; the second shortly after was attacked, but eventually recovered; and the third man drove the three carts into Khandwa, bringing his sick friend and the body of his dead one. Cholera did not appear in Khandwa until the expiration of five months afterwards." Again—"On the 12th there was a gathering and feast at Khanapur, in the Beria circle, chiefly composed of residents of the Holkar State, across the river. Cholera appeared among them; of the five attacked at Khanapur, two died. The remainder fled across the river."

On the 18th cholera appeared at Bilera, a small village on the Nerbudda, 3 miles east of Mortakka; on the 20th at Surgon Josi, near Khandwa; on the 27th at Ghosli, a village on the Holkar State Railway, where a large gang of coolies were working; and on the last day of the month a man was taken out of the train at Sanawad who had come from Indore. Prior to these outbreaks both the districts of Betul and Nimar, like that of Hoshangabad, had been free from all sign of the presence of cholera during the preceding fifteen months. In each of these districts the disease now ran an active and severe epidemic course. In Hoshangabad it attained highest intensity in June and July, and finally subsided in October; in Nimar the climax was in August, and the disease ceased in November; in Betul the greatest mortality occurred in August and September, and the disease, though subsiding, was still present at the close of the year.

In April cholera appeared in the Saugor, Chanda, Raipur, and Sambalpur districts. In Saugor it prevailed with greatest intensity in July and August, and ceased entirely by the end of October; in Chanda also in the same months, but it ceased in September; in Sambalpur the maximum prevalence was in June and July, and the disease continued steadily prevalent to the close of the year. In Raipur cholera burst out with explosive violence in April; the deaths registered in that month amount to 55; but in May, June, and July the numbers were 3666, 4346, and 4026 respectively; in August the number fell to 1311, and during the next three months to 227, 196, and 163 respectively; but in December the disease burst out afresh in a sudden explosion, and the deaths registered amounted to 3086. No details are given of this remarkable mortality with which the epidemic terminated in this district in December; the total of cholera deaths in the Raipur district was 17,076 in this year, or not very much short of half the entire mortality registered from the disease in the whole province during the year.*

In May cholera appeared in the districts of Burhanpur, Balaghat, Nagpur, Bhandara, and Wardha, and in all of them ran a violent epidemic course, raged with greatest severity from June to September inclusive, and suddenly ceased entirely in October. The greatest force of the epidemic of this year was confined to the south-eastern districts of Raipur, Bilaspur, and Sambalpur; their combined mortality amounts to 21,585, or more than half the entire cholera mortality of the province during this year.

Of the other districts, none were violently affected, and all were free of the disease by December, except Seoni, which returns a single death in that month. Of all the districts, Narsinghpur alone preserved a complete

* According to another return, prepared by orders of the Commissioner, the total number of cholera deaths in the Raipur district is given at 24,593, of which 19,343 belonged to the Khalsa or Government tracts, and 5250 to the Feudatory States of Zamindari dependencies. "The police reports are to the effect that none of the persons first attacked had recently visited any villages where cholera was known to exist; indeed the distances of the villages apart would in some of the cases be sufficient almost to preclude the possibility of any intercommunication. Water is drawn from tanks and streams in this district."

immunity from the disease throughout the year, only a solitary death in September being recorded. The year 1878 began with no death registered from cholera in January, and with only 4 in February; it ended with 3160 in December, of which number 3086 were returned by Raipur alone. The only other districts that showed the presence of cholera in December were Betul, 22; Bilaspur, 41; Sambalpur, 10; and Seoni, 1. All the other districts gave no report of cholera in December. The tendency of the great cholera epidemic of 1878 in these provinces was to a complete subsidence in all parts of the country towards the close of the year, except in the Raipur district, where the unusual and extraordinary increase in the mortality returned for December indicates a fresh revival of cholera activity in that part of the provinces.

The rainfall of 1878 was much the same in amount as that of 1877, viz., 50.09 inches and 50.19 respectively; but the seasonal distribution differed greatly in the two years. Most of the rainfall in 1878 fell in the third quarter of the year, the fall in each of the other quarters being much less than in 1877, as is shown in the subjoined abstract form :—

1877 ...	1st Quarter, 4·75	...	2d Quarter, 13·47	...	3d Quarter, 27·09	...	4th Quarter, 4·88
1878 ...	,, ,, 1·51	...	,, ,, 6·44	...	,, ,, 40·00	...	,, ,, 2·14

Coupled with this heavy rainfall in the monsoon season there was general and severe distress from famine. The average price of wheat, which rose from 34.22 sers the rupee in 1876 to only 14.60 sers the rupee in 1877, rose still a little higher in 1878, viz., to 13.20 sers the rupee.

1879.—A sensible abatement occurred in the prevalence of cholera in this year compared with the severity of the disease in the preceding year; but the disease still retained unusual epidemic activity for this, the second, year of the cycle—a circumstance which, the statistics show, is attributable to the unfavourable conditions of the weather and the food-supply during the year. Among the civil population the number of deaths registered fell to 27,575 from 40,985 in the year before, and the death-rate to 3.72 from 5.53 respectively. The incidence of the cholera of this year among the troops and jails is shown in the tabular statements Nos. III. and IV.

"Cholera, it is related, attacked the convent at Kamptbi early in June of this year; 49 attacks and 22 deaths had occurred in the bazar up to the date of the first attack in the convent. An extraordinary fall of rain took place on the last day of May and the first of June, causing a high flood in the river, which swept through the regimental bazar, the inhabitants of which, fearing a repetition of the disastrous flood of 1876, fled with their children and goods to the convent for safety. The place became at once overcrowded and filled with a miscellaneous collection of goods. One of these people was attacked with cholera on the 6th June, but the nature of the disease was not then recognised. On the 8th one of the girls being educated there was attacked, and died. All refugees were then sent to their friends, the school was broken up, and the girls were sent to a house at some distance from the convent; but the disease clung to them, and attacked some of those who remained in the convent also; thus of 9 native girls attacked 3 died; of 20 European and Eurasian girls attacked 7 died; of 3 nuns attacked 1 succumbed; whilst the last person to take the disease was the venerable head of the establishment, who thus lost his life seventeen days after the commencement of the disease there. Prior and subsequent to this outbreak the establishment was kept in a good sanitary condition, and the inmates were in good health."

Regarding the severity of the disease in particular localities, it is stated that some villages suffered severely; thus in a village of 813 persons in Betul 183 died, in a village in Seoni containing 855 souls 106 were attacked, in another 71 out of 363 were attacked, and so on in many other instances. "As a rule the villages were filthy and dirty; no attempt at sanitation;

rubbish of the village deposited at the entrance or just near the fences; the shrubby jungle or the screened nalah was the latrine of the village. Where water was abundant, as in rivers or large nalahs, no attempt was made to keep apart a place for pure water for drinking; the people washed, bathed, and drew water alike in the one and the same place, and at times it was fouled also by cattle herding in it." Throwing bodies into the streams is still practised in some places. In Raipur it was the custom to take persons suffering from cholera to streams or tanks, and immerse them in the water for an hour to relieve the burning heat and pain. It is added that "immediate instructions were issued in view to put a stop to this practice."

The rainfall of 1879 was even more plentiful than that of the year before by nearly 3 inches. The greater portion fell during the monsoon season, but the fall in the last quarter of the year was also unusually large. Food was still at famine rates, and but very slightly cheaper than in the year before.

1880.—There was a continued and very marked abatement of cholera prevalence in this year; the disease, in fact, had subsided into complete epidemic quiescence. The total of cholera deaths registered among the civil population amounted to only 330, or at the rate of 0.04 per mille against 27,575 and 3.72 respectively in the preceding year.

The cholera of 1880 in the Central Provinces was confined to a few limited outbreaks in the districts of Raipur, Bilaspur, and Sambalpur. Regarding the appearance of the disease in Raipur, where the violent and destructive epidemic of the preceding year had ceased to be fatal from the end of September 1879 to the beginning of March 1880, the following particulars are recorded:—"Cholera appeared in some villages of the town circle. The first cases occurred in persons who had visited the bazar at Baloda, where there was no cholera." The returns show that 7 villages in all were attacked, and that 93 deaths occurred; that "the men who had been to Baloda on the 23d March were seized on their return to their villages, and that other persons who had travelled were seized on their return, and cholera broke out in their villages. It is further shown that persons who had visited the villages of Kora and Kambari at the time cholera was there died on their return, cases commencing the same day in their villages." It was not until September, when cholera had disappeared from the town and district, that the disease appeared in the jail. "Fortunately but few cases occurred, as the disease was very fatal—3 deaths in 4 seizures." In the Jubbulpore Jail, it is stated, an outbreak of cholera occurred on the 29th July, and continued until the 6th September, during which period there were 23 cases and 11 deaths. "No explanation can be given of this outbreak, except that the poison of cholera was in the atmosphere, and the jail was not in a good sanitary state, from bad surface and subsoil drainage. . . . Cholera did not exist either in the town or district."

In the Raipur district, it is recorded that cholera first commenced in the headquarters town, and was confined to two portions in close proximity to each other.

"On the 2d March a chaprassi employed by the Zamindar of Laafa arrived in the town, and took lodgings in the Golbazar, which was also occupied by a man, his wife, and child. The chaprassi was seized in the night with a mild attack of cholera, which terminated favourably. He stated there was no cholera at Laafa, that he met no pilgrims, nor did he lodge in any village where there was sickness. On the 3d March the child was attacked, and died on the 4th. The mother on the 6th. She died on the 8th. On the 7th the father was taken ill. He died on the 9th. On the same day and evening 3 more cases occurred, 1 in the room adjoining that in which the 4 cases just mentioned hap-

pened. This was in a man who had come from Lima, in the Ratanpur circle, where there was no cholera. The other two cases occurred at Gondpara, at the back of Golbazar. On the 10th another man was seized in the same locality, and on the 12th a man in Golbazar was attacked. He died during the night. On the 14th a woman was taken ill at Gondpara, close to the house in which the man died on the 9th. For four days there was no further attack, but on the 18th a woman in Golbazar was seized. She took ill on the day her husband returned from Hirri, a place where no cholera existed. He stayed nowhere on the road either going or returning; neither did he meet any pilgrim on the road."

Regarding the appearance of cholera in the Bilaspur district, it is stated that "four cases occurred at Masturi, a village 10 miles from Bilaspur, on the road to Seonarain. Two of these were in men who had returned from Golbazar, where they had sold grain. Both died. But the two others had never left Masturi, nor had they any communication with the two former on their return from Bilaspur." Next followed a sharp but short outbreak at Ratanpur, in the district. Here, from the 3d to 9th April, both days inclusive, 60 cases occurred, with 22 deaths. This was followed by slighter attacks in Karnod and Hassod. "The disease may be said to have disappeared about the end of July." In reference to this outbreak in Bilaspur, it is very pertinently asked, "Did the chaprassi from Laafa introduce the disease into Golbazar, or was he not rather one of the sufferers from the insanitary condition of that place?" The civil surgeon states that both in 1878 and 1879 cholera appeared in the very room in which the four seizures took place. "Again, did the two men who were seized and died at Masturi, after returning from Golbazar, carry the seeds of the malady with them, or were they not rather overtaken by the same poisonous influence which proved fatal to two other men of the village, and who had never left it?"

Regarding the appearance of cholera in the Sambalpur district, the following particulars are recorded :—

The disease appeared in the early part of June in the Sarangarh State; 100 persons were attacked, of whom 65 died. In the end of July it made itself known in the Padampur Zamindari. In this place 241 attacks and 64 deaths were reported. It then travelled to Ambabona, in the Khalsa portion of the district, and adjoining that of Sarangarh. In this place and the villages about it 122 attacks and 54 deaths took place. Cholera now approached the town of Sambalpur, and appeared in villages in its vicinity. The first case reported occurred on the 5th August at Chandapali, 3 miles to the north; the next at Behra, 3 miles to the south, on the 7th August; 124 cases in all are reported to have occurred in the district up to the 23d August, on which day the first cases of cholera occurred in the town. "On the 24th a constable on jail duty was attacked; he died on the evening of the day of his seizure. The prisoners remained free until the 1st September. From that date up to the 11th, when the seizures ceased, 13 attacks had taken place, followed by 11 deaths. After a month's freedom, the disease reappeared quite suddenly, and attacked 2 prisoners, who both succumbed. These additional cases raise the total to 15, and deaths to 13. The large proportion of fatal cases (86.6 per cent.) proves how virulent the poison could be, and what destruction of life it might have occasioned in the jail had it continued unchecked. It is noteworthy that of the 13 deaths 4 occurred in what are called the Dhunkara sheds, among prisoners who had been moved there for the benefit of purer air. These sheds were in good repair, but had been used for the accommodation of prisoners in 1879; 30.7 per cent. of the seizures and deaths occurred there. The number of cases amongst the prisoners bore a relation to the frequency of the occurrence of cases in the town. The severity of the outbreak was over by the 13th September. The number of cases in the town was 50, with 31 deaths, giving a percentage of 62. This is heavy mortality; and had cholera only existed in epidemic force, the population must have suffered intensely. In the district a total of 217 seizures and 111 fatal cases occurred; this gives a percentage of 51.1. In the Feudatory States, 410 cases, with 232 deaths, were recorded, or 56.5 per cent. The last cases seem to have happened about the closing part of October."

Regarding the solitary deaths registered in Hoshangabad, Seoni, and Balaghat, particulars are given of that which occurred in Hoshangabad only.

The victim was a Brahmin, resident of Sohagpur, who had returned from Semri, a neighbouring village, on the night of the 31st January. "He was in a weak state of health, having been suffering from diarrhœa some time previously. At 12 P.M. on the 31st he ate an ordinary meal; at 1 A.M. he sickened with diarrhœa and vomiting, which latter continued up to 4 A.M., when, having passed into a state of collapse, he died, having had only two loose stools."

The rainfall of the year 1880 was more than 4 inches less than that of 1879, but it was fully up to or somewhat above the average fall for these provinces. It was also seasonably distributed. In the prices of food a very great improvement had taken place in 1880; cheap rates and plenty had succeeded the high prices and scarcity of the three preceding years. The average price of wheat in 1880 was 30.51 sers the rupee against 14.66 sers in 1879, and 13.20 and 14.60 sers respectively in the two years before that.

1881.—In this year cholera again prevailed, with a revived epidemic activity, although in comparatively mild intensity, the rainfall being favourable and the food-supply plentiful. This revival of epidemic cholera activity in 1881, the first year of a new triennial cycle, was due in the normal course, as observed to obtain in previous years; and the mildness of its epidemic prevalence, as was the case also in the corresponding cyclical years 1872 and 1875, was due to the favourable conditions in respect to rainfall and food-supply.

In 1881 the cholera deaths registered among the civil population rose to 9140 and the death-rate to 1.23 per mille from 330 and 0.04 respectively in the preceding year.

Compared with the course of the disease in the preceding year, the cholera of 1881 is shown to have started into fresh epidemic activity all over these provinces. In 1880 only 6 out of the 21 districts recorded cholera, and of these 3 returned only single deaths each; 327 out of the total of 330 cholera deaths registered in the year being contributed by the 3 districts of the Mahanadi division, viz., Raipur, Bilaspur, and Sambalpur. In the first of these the disease commenced activity in March, ceased entirely in the following month, and the district remained free of cholera during the rest of the year. In the second cholera appeared in March also, but continued till July, when it finally ceased, and for the rest of the year the district remained free of the disease. In the third cholera did not appear until August, and continued until October, when it finally ceased. After the month of October, excepting a single death registered in December in Balaghat, no cholera mortality was recorded in 1880 in any part of the Central Provinces.

The year 1881 opened with no record of cholera in any part of these provinces, excepting the single district of Sambalpur, in which twelve deaths from this cause were registered in January. In March the other two districts of the Mahanadi division also recorded cholera, but the rest of the provinces still remained free. In March the disease commenced activity in all three districts of the Vindhyan division, away to the north-west, in the opposite extreme of the provinces; and three deaths from it were also recorded in the intervening Mandla district. During April cholera was active only in the previously affected Mahanadi and Vindhyan districts; but it appeared also in epidemic form in the Jubbulpore district, and a single death was recorded in that of Hoshangabad, both in the Nerbudda division.

In May the disease had subsided in the Bilaspur and Sambalpur districts, but prevailed with increased activity in Raipur, and attained its maximum intensity in the Vindhyan districts and in Jubbulpore. In these last the maximum intensity was continued through June, in which month cholera reappeared in Mandla, and broke out with some violence in Seoni also, both in the Satpura division; whilst it acquired increasing force in Raipur, and appeared, for the first time in this year, in Narsinghpur district of Nerbudda division. In July cholera appeared in the Burhanpur and Balaghat districts, and in all the districts of the Wainganga division; in this month, whilst subsiding in the Vindhyan districts and Jubbulpore, the disease rose to its maximum prevalence in Raipur. In August the force of the epidemic was confined to the Wainganga districts, and to those of Narsinghpur and Raipur; and in these the disease continued, though gradually abating, until its final cessation in November.

During the year every district was affected by cholera, though that of Betul recorded only two deaths, both in September. In December these provinces were clear of the disease, only three cholera deaths being registered in that month, and all in the Bhandara district. In its course through the Central Provinces the cholera of 1881 is shown by the mortality returns to have commenced in the beginning of the year in the south-eastern districts, then to have broken out in March in the north-western districts, and finally to have spread south and east again through the districts of the Wainganga division, in which it disappeared, leaving the western districts almost completely untouched. In other words, the disease, commencing in the south-east, circled round to the north-west, and then round to the south and east again.

The rainfall of 1881 was very abundant, being about $5\frac{1}{2}$ inches more than that of the preceding year, and nearly 7 inches in excess of the average; it was also fairly and seasonably distributed. Food also was abundant and cheap—cheaper even than in the preceding year.

Summary Review.—The foregoing annual record of cholera experience in the Central Provinces shows very clearly that the disease recurs in epidemic revival in regularly successive cycles of three years each. The record also shows that on occasions of drought and famine this regularity of epidemic cholera prevalence is more or less seriously disturbed by the aggravating effects of these conditions, but that the periodical epidemic revival of the disease occurs independently of such conditions, although with less severity and violence when they are absent. A reference to Table No. I. will show the periodicity of epidemic cholera prevalence in the Central Provinces during the series of twenty years dealt with in this inquiry, together with the irregularities that have occurred in the course of the disease in the triennial cycles 1866–68 and 1875–77, from the causes above alluded to; and illustrations of the concurrence of those conditions with the irregularities mentioned will be found by a reference to Table No. V.

In Table No. II. the seasonal prevalence of cholera in these provinces, as gauged by the mortality from that cause registered monthly, is shown for the fourteen years from 1868 to 1881 inclusive. The mean monthly mortality from the disease, as registered during this period, shows that the season most favourable to the epidemic prevalence of cholera in the Central Provinces is the season of the south-west monsoon rains, and the hot weather immediately preceding them, that is, from the month of May to that of August, both inclusive. During the cold weather in the Central Provinces cholera is rarely prevalent in epidemic form, or, at least, in epidemic

form at all comparable with that which obtains in the hot weather rainy season. The season of least cholera prevalence for the hot-weather epidemic is about the month of September or October, and that for the cold-weather epidemic about January or February. On the whole, the figures show that epidemic cholera in the Central Provinces is essentially a disease of the hot-weather or south-west monsoon rainy season.

In Table No. V. are exhibited at one view the death-rates from cholera in the Central Provinces among the troops, both European and Native, and the jail populations, separately and combined, and among the civil population, together with the average rainfall, by the year and its several quarters, and the average annual price of the staple food-grain for the whole series of years from 1862 to 1881, both inclusive, so far as the data have been found available. For the first year of the series, and for the first triennial cycle—1863–65—the death-rates among the troops and jails only are available, the death-rate among the civil population for 1865 being more of a rough estimate than a regular statistical record. The death-rates among the troops and jails show a very severe and unusual prevalence of epidemic cholera throughout the three years of this cycle, and especially during its two last years. In these latter the disease, in the normal course, should have been steadily and progressively subsiding into abeyance from the epidemic violence of the first year, but it is shown by the figures to have been increasingly severe in its usual seasonal prevalence during each of these two successive years. This irregularity, or divergence from the ordinary course, was accompanied by severe drought and scarcity of food in 1864, and by deficient rainfall and hard famine in 1865. As these conditions have been found to be constant accompaniments of such irregular epidemic prevalence and aggravated severity of cholera mortality in other triennial cyclic periods, not only in these provinces, but in other parts of India also, we may consider the results in the relation of cause and effect.

In the next triennial cycle—1866–68—and in those following it, we have the statistics of cholera mortality complete for all classes of the population. In the cycle 1866–68 we find cholera in revived epidemic prevalence in the first year, and almost completely subsided into absolute quiescence in the second, but again breaking out in epidemic form in the third, instead of, as in the normal course was due, remaining in abeyance. This irregularity of cholera prevalence in 1868 was coincident with comparatively severe drought following upon a year of exceptionally abundant rainfall, and coincident also with a return to high prices of food.

In the cycle 1869–71 cholera pursued the ordinary course of epidemic prevalence in revived activity during the first year, of abatement in the second, and of subsidence or quiescence in the third. And this course was coincident with famine in the first year, and progressively improving rates for food in the others; whilst the rainfall in all three years was abundant, and generally well above the average.

In the cycle 1872–74 cholera again pursued the regular course of epidemic revival in the first year, abatement in the second, and quiescence in the third, although in an unusually mild form throughout the cycle. This very mild prevalence of cholera was coincident with unusual abundance of food throughout the cycle, and with a plentiful rainfall in its first and last years, which apparently served to mitigate the hardships and privations otherwise resulting from the deficient rainfall in the intermediate year.

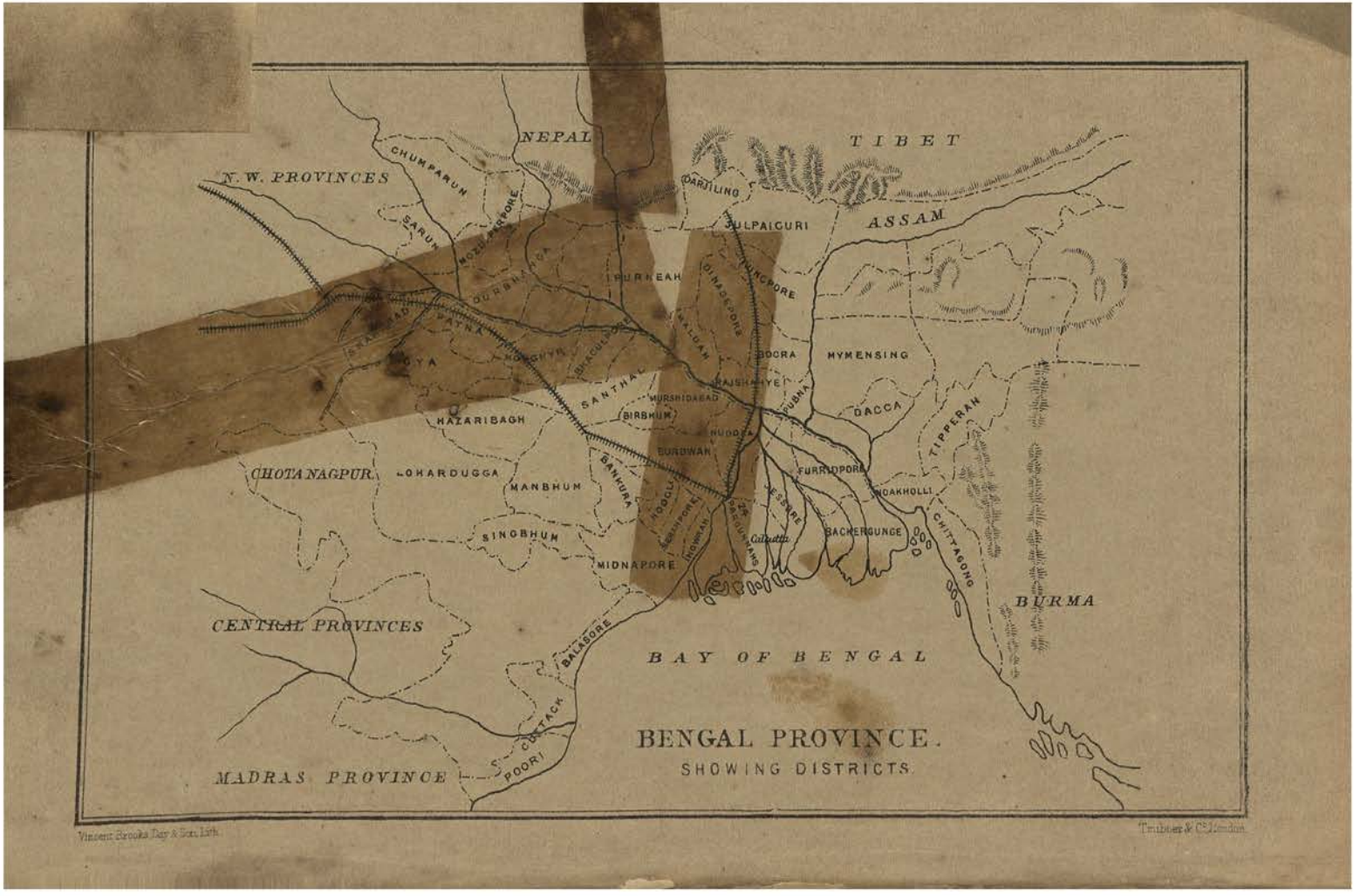
In the cycle 1875–77 again cholera pursued a generally normal course of revived epidemic activity in the first year, and subsidence into abeyance

in the third; but in the second year the disease prevailed with unwonted severity among the civil population. This irregularity was coincident with deficient rainfall in 1876, and with scarcity of food in the parts chiefly affected by cholera in that year. In 1875 the rainfall was plentiful and food unusually cheap; but in 1877, though the rainfall was abundant and well above the average, the price of food had returned to famine rates.

In the cycle 1878–80 cholera once more followed the regular course of epidemic revival in the first year, abatement in the second, and subsidence in the third; and this course was accompanied by famine in the first and second years, and cheap food in the third; whilst in all three years the rainfall was abundant and well above the average.

A comparison of the cholera mortality with the rainfall and food-supply for the series of years subsequent to 1865 inclusive (see Table No. V.) shows that the severe epidemic cholera of 1865 was preceded by a year of drought, and accompanied by a year of food scarcity; that the mild epidemic cholera of 1866 was preceded by a year of lesser rainfall, and accompanied by famine rates for food. Again, that the very severe epidemic cholera of 1869 was preceded by a year of drought, and accompanied by a year of sore famine; that the exceptionally mild epidemic cholera of 1872 was preceded by a year of lesser, though still more than average, rainfall, and accompanied by cheap rates for food. Again, that the mild epidemic cholera of 1875 was preceded by a lesser, though still plentiful and much above the average, rainfall, and accompanied by unusually cheap food; that the severe epidemic cholera of 1878, though preceded by a year of equally abundant rainfall as its own, was preceded and accompanied by years of severe food-scarcity—caused by the large exportations of grain during 1877 and 1878 to other famine-struck parts of Southern India. And lastly, that the mild epidemic cholera of 1881, though preceded by a year of lesser rainfall, which, however, was fully up to the average, was accompanied by unusually cheap and abundant food-supply.

It appears, then, from these successively recurring precedent and coincident or concurrent conditions, that the severity or mildness of an epidemic cholera, appearing in the normal course of its periodical development, is largely influenced by the degrees of drought and famine with which its advent is contemporaneously connected. In the year 1874 cholera, as we have seen, was absolutely quiescent, although the preceding year was one of drought; but then this was, as being the last of the cycle, a year for the normal abeyance of the disease, and the food-supply, moreover, was abundant and cheap. It appears, from the data furnished in the Table No. V., that cholera naturally recurs in revived epidemic form in every third year, and that this revival is usually preceded by a period of greater or less absolute or comparative drought; and, further, that the character of the epidemic, in point of severity or mildness, is determined mainly by the conditions of the food-supply—being virulently destructive and prolonged in duration in proportion to the intensity of famine and endurance of food-scarcity, and being mildly prevalent and of short course in proportion to the abundance and cheapness of the food-supply.


NEPAL
TIBET
N.W. PROVINCES
CHUMPARUN
SARUN
MOZUFFERPORE
DARJILING
JULPAIGURI
ASSAM
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RUNGPORE
BOGRA
MYMENSING
RAJSHAHYE
PUBNA
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Calcutta
BURMA
CENTRAL PROVINCES
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MADRAS PROVINCE
BENGAL PROVINCE.
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Vincent Brooks Day & Son, Lith.
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SECTION VI.

BENGAL PROVINCE.

Geographical Position.

THE Province of Bengal, or Lower Bengal, as it is also called, comprises the lower valleys and deltas of the Ganges, Brahmaputra, and Mahanadi rivers, and lies between 19° 18′ and 28° 15′ N. lat., and between 82° and 97° E. long. Excluding Assam, which was erected into a separate administration in February 1874, the Bengal Province now includes the four great divisions of Bengal Proper, Behar, Orissa, and Chota Nagpore. Its divisions, districts, area, and population are shown in the annexed tabular statement.

STATEMENT *showing Population, Area, and Density of Population in each District of the Bengal Province for the Year* 1872.

Divisions.	Districts.	Population (Census 1872).			Total of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Burdwan.	Burdwan . .	995,818	1,038,907	2,034,745	7,286,957	3,523	12,719	578	572
	Bankura . .	261,690	265,082	526,772		1,346		391	
	Beerbhum . .	334,550	361,371	695,921		1,344		518	
	Midnapore . .	1,257,194	1,283,769	2,540,963		5,082		500	
	Hooghli . . .	173,492	190,143	363,635		436		834	
	Serampore . .	193,022	200,842	393,864		349		1,129	
	Howrah . . .	356,342	374,715	731,057		639		1,144	
Presidency.	24-Pergunnahs	1,155,759	708,291	1,553,620	6,097,863	2,788	9,867	793	618
	Nuddea . . .	877,125	935,670	1,812,795		3,421		530	
	Jessore . . .	1,051,126	1,023,895	2,075,021		3,658		567	
Rajshahye.	Murshidabad .	645,335	708,291	1,353,626	8,893,738	2,578	17,694	525	502
	Dinagepore .	776,431	725,493	1,501,924		4,126		364	
	Maldah . . .	331,087	345,339	676,426		1,813		373	
	Rajshahye . .	650,586	660,143	1,310,729		2,234		587	
	Rungpore . .	1,095,026	1,054,946	2,149,972		3,476		619	
	Bogra . . .	347,864	341,603	689,467		1,501		459	
	Pubna . . .	602,514	609,080	1,211,594		1,966		616	
Kuch Behar.	Darjiling . .	53,057	41,655	94,712	513,377	1,234	4,140	77	124
	Julpaiguri . .	216,893	201,772	418,665		2,906		144	
Dacca.	Dacca . . .	905,775	947,218	1,852,993	7,592,292	2,897	15,621	640	486
	Furridpore . .	497,854	514,735	1,012,589		1,496		677	
	Backergunge .	1,204,273	1,173,196	2,377,433		4,935		482	
	Mymensingh .	1,187,962	1,161,955	2,349,917		6,293		373	

Continuation of Statement showing Population, Area, and Density of Population in each District of the Bengal Province for the Year 1872.

Divisions.	Districts.	Population (Census 1872). Males.	Females.	Total.	Total of Divisions.	Area in square miles. District.	Division.	Population per square mile. District.	Division.
Chittagong.	Chittagong.	536,059	591,343	1,127,402	3,375,267	2,498	6,710	451	503
	Noakholli	362,067	351,867	713,934		1,557		459	
	Tipperah	782,391	751,540	1,533,931		2,655		578	
Patna.	Patna	761,877	797,761	1,559,638	13,122,743	2,101	23,732	742	552
	Gya	954,129	995,621	1,949,750		4,718		413	
	Shahabad	835,374	888,600	1,723,974		4,385		393	
	Tirhut	2,191,764	2,192,942	4,384,706		6,343		691	
	Sarun	996,683	1,067,177	2,063,860		2,654		778	
	Chumparun	737,529	703,286	1,440,815		3,531		408	
Bhagulpore.	Monghyr	897,074	915,912	1,812,986	6,613,358	3,913	18,635	463	353
	Bhagulpore	917,133	909,107	1,826,290		4,327		422	
	Purneah	876,320	838,475	1,714,795		4,957		346	
	Rajmahal	94,258	96,632	190,890		?		?	
	Sonthal	535,458	532,939	1,068,397		5,488		229	
Orissa.	Cuttack	725,330	759,454	1,494,784	3,034,690	3,178	7,717	470	393
	Poori	389,449	380,225	769,674		2,473		311	
	Balasore	379,077	391,155	770,232		2,066		373	
Chota Nagpore.	Hazaribagh	397,045	374,830	771,875	3,419,591	7,021	28,482	110	120
	Lohardugga	621,548	615,575	1,237,123		12,044		103	
	Singbhum	207,926	207,097	415,023		4,503		92	
	Manbhum	500,936	494,634	995,570		4,914		203	
Total of the province		29,870,216	30,080,300	59,950,516		145,367		412	

The Bengal Province is the largest and most populous of the Provincial Governments of British India, and yields a gross revenue of about one-third of the aggregate revenues of the Indian Empire. The Bengal Province is bounded on the north by Assam, Bhutan, and Nepal; on the east by the unexplored mountainous region which separates it from China and Northern Burmah; on the south by Burmah, the Bay of Bengal, and Madras; and on the west by an imaginary line running between it and the adjoining local government of the North-Western Provinces, and by the plateau of the Central Provinces.

Of the four great divisions of the Bengal Province, Bengal Proper, Behar, and Orissa consist of great river valleys, while the fourth, Chota Nagpore, is a mountainous region which separates them from the Central India plateau. Orissa embraces the rich delta of the Mahanadi and the neighbouring rivers, bounded by the Bay of Bengal on the south-east, and walled in on the north-west by Tributary Hill States. Proceeding eastward, Bengal Proper stretches along the coast from Orissa to British Burmah, and inland from the seaboard to the Himalayas; its southern portion is formed by the united deltas of the Ganges and Brahmaputra; its northern consists of the valleys of these great rivers and their tributaries. Behar lies on the north-west of Bengal Proper, and comprises the higher valley of the Ganges, from the spot where it issues from the territory of the North-Western Provinces. Between Behar and Orissa, but stretching farther westward and deep into the hill country, lies the Chota Nagpore territory.

Physical Aspects.

The territory thus hemmed in, except at its north-western angle, by the unchangeable landmarks of nature consists chiefly of two broad valleys. By the western one the Ganges brings down the wealth and accumulated waters of Northern India. By the

eastern valley, the Brahmaputra, after draining the Tibetan plateau far to the north of the Himalayas, and skirting round their passes not far from the Yang-tse-Kiang and the great river of Cambodia, ends its tortuous journey of 1800 miles. These valleys, although for the most part luxuriant alluvial plains, are diversified by spurs and peaks thrown out from the great mountain systems which wall them in on the north-east and south-west. They yield in abundance every vegetable product which feeds and clothes a people, and enables it to trade with foreign nations. The soil is equally varied. The districts near the sea consist entirely of alluvial formations; and, indeed, it is stated that no substance so coarse as gravel occurs throughout the delta, or in the heart of the province within 300 miles of the river-mouths. But amid the hilly spurs and undulations on either side coal and iron and copper ores abound.

Climate.

The climate varies from the snowy regions of the Himalayas to the tropical vapour-bath of the delta and the burning winds of Behar. The ordinary range of the thermometer on the plains is from about 52° F. in the coldest month to 103° in the shade in the summer; anything below 60° F. is considered very cold. The rainfall also varies greatly—from 500 to 600 inches per annum at Cherrapunji, in Assam, to an average of about 37 inches in Behar and about 65 inches on the delta.

Behar.—This great division of the Bengal Province lies between 23° 49′ and 27° 19′ N. lat., and between 83° 22′ and 88° 35′ E. long., and comprises the ten districts of Patna, Saran, Gya, Shahabad, Tirhut, Chumparun, Sonthal, Bhagulpore, Monghyr, and Purneah. The country generally is flat, except in the district of Monghyr, where detached hills occur; and in the south-east, where the Rajmahal and Sonthal ranges abut upon the plains. The highest hill is Moher—1620 feet—in Gya district; the range in the Sonthal district varies from 800 to 1600 feet in height. The great river is the Ganges, which, entering at Baxar and leaving at Rajmahal, divides Behar into two almost equal portions. Both portions are watered by large tributaries of the Ganges, the chief of these being the Gogra, the Gandak, the Kusi, the Mahananda in the north, and the Sone in the south.

Chota Nagpore.—This great division of the Bengal Province, called also Chutia Nagpore, lies between 21° 58′ 30″ and 24° 28′ N. lat., and between 83° 22′ and 87° 15′ E. long.; and is bounded on the north by the districts of Mirzapur, Shahabad, and Gya; on the east by the districts of Monghyr, Sonthal, Bankura, and Midnapur; on the south by the Orissa Tributary States; and on the west by the Sambalpur district of the Central Provinces and the Independent State of Rewah. This division comprises the British districts of Hazaribagh, Lohardugga, Singbhum, Manbhum, and seven Tributary States.

Orissa.—This division lies between 19° 28′ and 22° 34′ 15″ N. lat., and between 83° 36′ 30″ and 87° 31′ 30″ E. long., and comprises the districts of Cuttack, Balasore, Poori, and Hill States. It forms the extreme south-western portion of the Bengal Province, and is bounded on the north and north-east by Chota Nagpore and Bengal Proper, on the east and south-east by the Bay of Bengal, on the south by Madras, and on the west by the Central Provinces. Orissa consists of two distinct territories—a fertile alluvial delta, comprising the three British districts of Cuttack, Balasore, and Poori; bounded on the east and south by the sea, and on the west and north by a wild region of sparsely populated Tributary Hill States, which walls it out from the Central Indian plateau. The Orissa delta is formed from the deposits of three great rivers—the Mahanadi in the south, the Brahmani in the centre, and the Baitarani in the north. The three rivers gradually converge towards the coast, and dash down their accumulated waters, within 30 miles of each other, upon Orissa. During summer their upper channels in the interior tableland dwindle to insignificant streams, dotted here and there by stagnant almond-shaped pools. Including two other minor streams—the Salandi and Subanrekha—they represent the accumulated drainage of 63,350 square miles, which during the height of the hot weather only amounts to a discharge of 1690 cubic feet per second. The average cold-weather discharge is, however, 5360 cubic feet per second; but during the rains the rivers rise till they bring down an aggregate of 2,760,000 cubic feet in time of flood. This enormous mass of water falls suddenly upon a narrow level strip of country. The river-beds are altogether inadequate to carry off the flood. Thus, while the Mahanadi alone pours down 1,800,000 cubic feet per second in the height of the rains, the whole of its distributaries in the Orissa delta can only discharge 897,449 cubic feet per second. It follows, therefore, that only one-half of the waters thus brought down find an outlet through the deltaic distributaries to the sea. The other half bursts over the banks and sweeps across the country. As pointed out by Dr. Hunter in

his *Orissa*—"The Mahanadi illustrates in a striking manner the biography of a great Indian river. Rising in Central India, 520 miles off, it collects the rainfall of 45,000 square miles, and pours down on the Orissa delta through a narrow gorge just above Cuttack city. In its first stage it runs on a lower level than the surrounding country, winding through mountain-passes and skirting the base of hills. During this long part of its career it receives innumerable tributaries from the higher country on both banks. So far it answers to our common English idea of a river. But no sooner does it reach the delta than its whole life changes. Instead of running along the lowest ground, it finds itself hoisted up on its own deposits of silt, its banks gradually forming ridges, which rise above the adjacent country. Instead of receiving affluents, it shoots forth distributaries. The silt gradually accumulates in the bed and on its margins until its channel shallows, and its capacity as an outlet for the waters which pour into it from above diminishes. The same process goes on in every one of the hundred distributaries into which the parent stream breaks up; and as the beds grow more shallow their total discharging power becomes less and less adequate to carry off the water-supply to the sea. As the rivers in the delta thus gradually build themselves up into high-level canals, so the lowest levels lie about half-way between each set of their distributaries. The country, in fact, slopes gently downward from the river-banks, and in time of flood the overflow is unable to make its way back again into the rivers. The waters stand deep upon the harvest-fields long after the main channels have run down. They slowly search out the lines of drainage, accumulating in stagnant swamps, drowning the crops, and poisoning the air with malaria, until they dry up or at last reach the sea. Even in periods of quiescence the rivers form a complicated network of channels, which crawl eastwards by innumerable bifurcations, interlacings, and temporary rejunctions and divergencies." Besides its copious water-supply, Orissa has a local rainfall of 62½ inches per annum. Nevertheless the uncontrolled state of the water-supply has subjected the country from time immemorial to droughts no less than to inundations. (Hunter's *Imperial Gazetteer.*)

The Tributary Hill States of Orissa, nineteen in number, which form the mountainous background of this division of the Bengal Province, occupy a succession of ranges rolling backwards towards Central India. They furnish no cholera statistics, and therefore require no further notice here.

Cholera History, Statistical and Descriptive.

The annexed tabular statements, Nos. I. to VI., which are uniform in details with the corresponding statements furnished for the other provinces, exhibit the statistics of cholera in the Bengal Province for the twenty years dealt with in this history. For the nine years 1862 to 1870 inclusive there are no records of the cholera mortality among the civil population of this province, and the statistics for the remaining years of our series, in respect to this great class of the population, are extremely defective, and the least reliable of those of any province under British administration in India. Fortunately the cholera statistics among the troops, both European and Native, and the jail populations, are very complete for the whole series of years. They serve to indicate the course of the disease during the years for which the civil population furnishes no statistics, and also to expose the amount of defective registration in the years for which the cholera mortality among the civil population has been recorded and tabulated.

No. I.—STATEMENT *showing the Annual Total Deaths registered from Cholera among the Civil Population in each of the Districts of the Bengal Province from the Year* 1871 *to* 1881 *inclusive.*

Districts.	TOTAL CHOLERA DEATHS REGISTERED AMONG THE CIVIL POPULATION IN THE YEARS.										
	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Burdwan . .	144	2,156	2,090	162	183	203	1,472	2,723	1,397	423	1,978
Bankura . .	38	268	995	66	95	156	167	338	841	478	788
Beerbhum .	84	706	786	611	22	330	693	448	399	1,547	637
Midnapore .	68	762	1,058	554	268	144	1,480	3,111	3,914	1,976	2,999
Hooghli . } Serampore }	656	649	454	385	270	829	768	935	459	754	1,416
Howrah . .	393	776	880	833	668	581	1,864	1,878	964	1,036	1,683
24-Pergunnahs	758	3,092	3,950	190	248	221	4,895	6,545	4,049	2,157	4,974
Nuddea . .	511	1,989	725	215	265	470	7,937	5,408	3,402	844	6,149
Jessore. . .	1,906	2,171	2,233	17	108	1,519	8,577	6,083	6,275	2,382	4,947
Murshidabad.	669	539	1,337	71	3	483	3,803	1,148	858	1,270	2,122
Dinagepore .	337	1,400	527	10	62	20	1,188	1,137	2,306	388	630
Maldah . .	603	52	1,389	13	114	114	4,401	520	1,797	391	530
Rajshahye .	1,546	429	607	382	27	725	2,436	673	1,058	161	3,330
Rungpore . .	617	1,985	413	59	222	13	1,385	3,548	3,189	49	2,607
Bogra . . .	356	104	295	6	98	38	1,617	730	1,061	150	299
Pubna . . .	456	506	484	114	187	257	3,828	1,089	1,011	312	2,375
Darjiling . .	9	205	21	2	19	709	4	266	20	...	17
Julpaiguri .	35	531	18	...	58	217	41	948	278	11	46
Dacca . . .	427	770	1,869	392	571	977	7,927	3,409	4,061	1,339	3,213
Furridpore .	519	429	303	162	85	723	4,070	2,459	4,457	924	2,180
Backergunge.	288	1,080	2,726	91	177	415	19,177	2,610	4,293	965	1,606
Mymensingh .	255	881	1,508	208	404	947	7,979	2,628	2,504	659	839
Chittagong .	94	1,302	943	158	34	749	8,698	143	2,833	1,226	12
Noakholli. .	192	361	846	28	97	583	21,858	270	291	75	318
Tipperah . .	359	865	2,276	35	39	254	3,378	1,492	2,196	627	747
Patna . . .	333	1,149	2,515	107	429	2,613	1,712	1,377	5,035	288	1,708
Gya. . . .	638	1,792	4,365	159	857	1,495	753	1,224	10,107	293	2,281
Shahabad . .	632	540	4,692	9	49	358	1,110	1,908	2,663	951	2,810
Tirhut . . .	85	1,490	6,040	180	568	1,214	5,052	2,245	16,468	3,125	5,670
Sarun . . .	222	518	1,757	213	120	721	1,658	843	3,200	1,137	1,835
Chumparun .	30	503	1,218	46	...	420	5,218	203	4,503	4,773	3,570
Monghyr . .	177	930	1,334	19	195	928	2,341	2,440	6,999	191	1,219
Bhagulpore .	420	208	913	220	165	601	2,617	6,875	4,816	196	780
Purneah . .	117	356	866	15	40	480	2,062	6,604	3,162	384	977
Rajmahal . } Sonthal . }	114	128	467	177	52	95	343	1,806	2,096	118	329
Cuttack . .	124	2,952	2,382	115	451	277	4,313	6,080	4,169	2,780	5,001
Poori . . .	9	1,207	821	90	82	1,110	5,795	7,569	1,766	2,372	2,162
Balasore . .	49	1,262	1,965	60	209	64	2,379	1,847	6,245	2,105	3,800
Hazaribagh .	61	111	328	17	133	251	77	2,444	1,243	307	140
Lohardugga .	123	46	386	5	4	206	52	404	5,566	300	28
Singbhum. .	4	27	208	4	11	41	33	116	1,476	128	173
Manbhum. .	52	289	840	145	15	504	147	668	2,936	51	255
Total .	14,510	37,536	59,830	6,345	7,704	23,055	155,305	95,192	136,363	39,643	79,180

NOTE.—The deaths registered in the years 1874 to 1876 inclusive relate only to the "Selected Areas" in each district, and are out of a gross population of 2,686,428 in the "Selected Areas" for 1874 and 1875, and 6,880,529 for 1876.

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Bengal Province for the Twenty Years from* 1862 *to* 1881.

Years.	Cholera Deaths Registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches and Cents.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera ordinarily prevalent.															...	68·25
1863	Cholera epidemically prevalent over the province generally.															...	64·11
1864	Cholera abating from previous year's epidemic prevalence.															...	63·77
1865	Cholera ordinarily prevalent, not generally epidemic.															...	65·61
1866	Cholera prevailed with unusually severe epidemic intensity.															...	65·28
1867	Cholera abated greatly from the previous year's prevalence.															...	67·59
1868	Cholera still less prevalent than in the preceding year.															...	66·61
1869	Cholera prevailed widely in epidemic form and much severity.															...	64·12
1870	Cholera still prevalent in epidemic form, but abating.														21,691	0·70	65·10
1871	254	220	304	1,327	1,225	814	436	432	609	1,396	2,390	5,103	?	?	14,510	0·25	75·95
1872	4,711	2,450	2,602	3,480	3,403	4,177	3,046	2,240	1,766	1,186	2,161	6,314	21,289	16,247	37,536	0·63	59·80
1873	3,924	3,143	5,487	8,544	7,281	5,365	7,792	8,064	3,793	1,350	1,665	3,422	23,982	25,848	59,830	0·94	48·72
1874	282	330	520	797	1,053	809	548	592	268	331	501	314	3,494	2,851	6,345	2·36	64·85
1875	186	339	618	1,037	963	927	577	473	355	480	946	803	4,402	3,302	7,704	5·76	60·83
1876	596	387	1,809	4,075	3,513	2,815	2,365	1,399	450	492	2,261	2,893	12,721	10,334	23,055	3·35	66·74
1877	38,142	18,216	11,872	17,187	12,140	5,478	4,943	4,759	5,280	5,983	13,713	17,592	84,918	70,378	155,305	2·58	66·21
1878	8,840	4,724	12,420	21,128	12,995	6,511	5,722	5,293	3,237	2,015	4,587	8,620	52,118	43,074	95,192	1·58	66·92
1879	6,089	4,006	8,177	11,348	15,839	30,147	25,802	15,945	4,939	2,237	3,968	7,866	76,100	60,263	136,363	2·27	65·45
1880	4,426	4,159	4,661	6,278	6,260	3,195	1,502	1,137	769	918	1,749	4,589	21,901	17,742	39,643	0·66	72·22
1881	3,999	2.616	7,119	18,434	10,833	5,324	6,753	7,155	2,409	2,711	3,674	8,153	43,153	36,027	79,180	1·32	68·63
Totals and Means	71,449	40,590	55,589	93,635	74,605	65,562	59,486	47,489	23,875	19,099	37,615	65,669	344,078	286,066	654,663	1·87	65·33

NOTE.—The cholera figures for the years 1874 to 1876 inclusive relate only to the "Selected Areas" of registration. Those for the other years to the population of the province as a whole. The aggregate population of the Selected Areas was 2,686,428 for the years 1874 and 1875, and 6,880,529 for 1876.

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the Bengal Province in Inches and Cents for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	RAINFALL IN INCHES AND CENTS IN THE MONTHS OF												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	0·63	0·51	1·29	3·05	5·03	12·13	12·56	12·80	11·27	8·75	0·14	0·09	68·25
1863	0·27	0·74	0·66	3·06	4·77	12·35	13·25	13·85	10·85	3·80	0·46	0·05	64·11
1864	0·26	0·95	1·09	1·65	5·01	11·47	13·92	13·38	10·40	5·02	0·57	0·05	63·77
1865	0·31	1·36	1·64	3·95	8·12	11·91	16·10	10·24	9·14	2·52	0·12	0·20	65·61
1866	0·91	1·86	0·79	3·26	4·17	12·60	12·94	13·05	9·87	5·59	0·19	0·05	65·28
1867	0·74	0·80	1·33	2·31	4·45	10·99	15·50	12·60	11·86	4·87	2·10	0·04	67·59
1868	0·23	1·26	0·81	3·49	4·92	15·24	10·90	16·24	11·82	1·55	0·13	0·02	66·61
1869	0·36	0·87	2·03	2·04	4·37	13·91	13·77	10·92	11·13	4·65	0·03	0·04	64·12
1870	0·30	0·14	0·56	1·83	3·06	12·83	13·98	14·10	10·48	7·37	0·45	0·00	65·10
1871	0·00	0·28	2·27	3·01	7·09	15·93	16·18	14·05	13·74	3·31	0·02	0·06	75·95
1872	0·42	1·15	0·22	2·10	4·14	10·05	13·10	10·32	10·98	6·90	0·29	0·13	59·80
1873	0·21	0·08	1·37	2·57	2·71	7·17	14·25	12·90	5·84	1·13	0·14	0·35	48·72
1874	0·88	2·46	1·15	1·59	4·52	11·87	10·52	9·77	13·70	7·95	0·43	0·01	64·85
1875	1·62	0·27	0·64	2·04	5·46	14·27	13·07	14·04	7·67	1·74	0·00	0·01	60·83
1876	0·04	0·36	1·24	1·65	5·35	11·46	15·73	14·34	10·05	5·70	0·81	0·01	66·74
1877	1·71	1·86	1·36	2·98	5·91	8·29	16·04	14·32	10·23	2·85	0·10	0·56	66·21
1878	0·61	0·58	0·93	2·93	6·84	8·36	14·94	14·85	11·82	3·05	1·77	0·24	66·92
1879	0·02	0·82	0·09	0·37	3·58	12·20	16·45	13·86	12·81	4·95	0·03	0·27	65·45
1880	0·37	2·88	1·56	1·37	6·49	15·07	13·71	15·84	8·95	5·43	0·36	0·19	72·22
1881	0·04	0·06	2·95	1·53	6·49	13·60	13·88	14·82	10·99	4·06	0·13	0·08	68·63
Means	0·49	0·96	1·19	2·34	5·17	12·08	14·03	13·31	10·63	4·55	0·41	0·12	65·33

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the Bengal Province, together with the Average Strength and Ratio of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Total.			Ratio per Mille of Strength.	
	Strength.	Cholera.		Strength.	Cholera.		Strength.	Cholera.		Strength.	Cholera.		Admissions.	Deaths.
		Admissions.	Deaths.		Admissions.	Deaths.		Admissions.	Deaths.		Admissions.	Deaths.		
1862	4,803	38	27	4,603	41	14	15,354	367	101	24,760	446	142	13·57	5·73
1863	4,112	20	16	6,507	55	20	15,028	1,007	335	25,647	1,082	371	42·18	14·09
1864	4,308	20	10	7,907	89	38	15,344	615	210	27,559	724	258	26·27	9·36
1865	5,050	24	17	9,488	275	150	17,328	415	155	31,866	714	322	22·40	6·97
1866	4,381	28	18	9,188	93	50	19,111	1,415	617	32,680	1,536	685	47·00	20·96
1867	4,162	7	6	5,650	65	33	16,945	363	162	26,757	435	201	16·25	7·51
1868	3,624	17	12	5,475	36	19	16,278	289	119	25,377	342	150	13·47	5·91
1869	3,718	7	2	5,080	41	20	17,194	488	182	25,992	536	204	20·62	7·85
1870	3,724	28	11	5,206	25	17	16,751	432	170	25,681	485	198	18·88	7·71
1871	3,744	10	6	2,745	7	5	17,021	131	41	23,510	148	52	6·29	2·21
1872	3,682	5	4	4,910	17	8	18,416	305	128	27,008	327	140	12·10	5·18
1873	3,505	6	2	5,253	29	16	19,929	354	144	28,687	389	162	13·56	5·65
1874	3,864	5	4	5,025	7	5	21,552	405	138	30,441	417	147	13·69	4·83
1875	3,017	...	...	5,419	16	7	21,229	302	98	29,665	318	105	10·74	3·54
1876	2,983	11	8	5,389	18	14	20,708	536	273	29,080	565	295	19·49	10·13
1877	2,797	3	2	5,592	9	6	18,353	331	148	26,742	343	156	12·82	5·83
1878	2,835	3	3	5,273	15	9	18,350	409	210	26,458	427	222	16·13	8·39
1879	2,253	1	1	4,128	5	3	18,317	682	336	24,698	688	340	27·86	13·77
1880	2,625	2	1	3,445	4	3	17,687	53	29	23,757	59	33	2·48	1·39
1881	3,149	4	4	5,773	33	15	16,015	185	86	24,937	222	105	8·91	4·21

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the Bengal Province for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	4,803	2,932	1·30	71	4,603	3,150	1·30	34	15,354	10,292	3·56	27
1863	4,112	4,000	0·49	80	6,507	4,088	1·34	36	15,028	14,672	6·87	33
1864	4,308	2,805	0·71	50	7,907	6,281	1·41	43	15,344	12,525	4·91	34
1865	5,050	3,217	0·74	70	9,488	7,973	3·45	54	17,328	12,023	3·45	37
1866	4,381	3,730	0·75	64	9,188	4,404	2·11	54	19,111	17,618	8·03	44
1867	4,162	3,351	0·21	86	5,650	3,422	1·90	51	16,945	11,828	3·07	45
1868	3,624	2,414	0·70	70	5,475	3,970	0·91	53	16,278	12,978	2·23	41
1869	3,718	1,521	0·46	28	5,080	4,159	0·98	49	17,194	13,990	3·49	37
1870	3,724	3,177	0·88	39	5,206	3,179	0·79	68	16,751	13,893	3·11	39
1871	3,744	2,440	0·41	60	2,745	2,631	0·27	71	17,021	10,170	1·29	31
1872	3,682	2,101	0·24	80	4,910	3,694	0·46	47	18,416	14,696	2·07	42
1873	3,505	1,587	0·38	33	5,253	3,438	0·84	55	19,929	14,123	2·51	41
1874	3,864	1,883	0·26	80	5,025	2,674	0·26	71	21,552	15,992	2·53	34
1875	3,017	...	...	...	5,419	4,396	0·36	44	21,229	15,541	1·94	32
1876	2,983	2,882	0·38	73	5,339	3,029	0·59	78	20,708	15,307	3·50	51
1877	2,797	1,469	0·20	67	5,592	3,175	0·28	67	18,353	13,720	2·41	45
1878	2,835	1,771	0·17	100	5,273	3,701	0·40	60	18,350	13,246	3·09	51
1879	2,253	751	0·13	100	4,128	2,548	0·20	60	18,317	15,072	4·52	49
1880	2,625	906	0·22	50	3,445	2,008	0·20	75	17,687	10,399	0·51	55
1881	3,149	1,625	0·25	100	5,773	1,885	1·75	45	16,015	9,521	1·94	46

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera, as represented by the Death-Rates registered among the Troops and Jail Populations, and among the Civil Population, of the Bengal Province for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Rice.*

Years.	Cholera Death-rate per Mille of Strength or Population.					Average Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Cents. per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Population.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	5·62	3·04	6·58	5·73	No information.	68·25	2·43	20·21	36·63	8·98	26·82
1863	3·89	3·07	22·29	14·09		64·11	1·67	20·18	37·95	4·31	26·24
1864	2·32	4·80	13·69	9·36		63·77	2·30	18·13	37·70	5·64	24·80
1865	3·37	15·81	8·94	6·97		65·61	3·31	23·98	35·48	2·84	18·98
1866	4·11	5·44	32·28	20·96		65·28	3·56	20·03	35·86	5·83	14·13
1867	1·44	5·84	9·56	7·51		67·59	2·87	17·75	39·96	7·01	20·92
1868	3·31	3·47	7·30	5·91		66·61	2·30	23·65	38·96	1·70	23·36
1869	0·54	3·94	10·58	7·85		64·12	3·26	20·32	35·82	4·72	20·51
1870	2·95	3·26	10·15	7·71	0·70	65·10	1·00	17·72	38·56	7·82	23·06
1871	1·60	1·82	2·41	2·21	0·25	75·95	2·55	26·03	43·97	3·39	25·81
1872	1·09	1·63	6·95	5·18	0·63	59·80	1·79	16·29	34·40	7·32	22·83
1873	0·57	3·04	7·22	5·65	0·94	48·72	1·66	12·45	32·99	1·62	19·65
1874	1·03	0·99	6·40	4·83	2·36	64·85	4·49	17·98	23·99	8·39	14·84
1875	...	1·29	4·61	3·54	5·76	60·83	2·53	21·77	34·77	1·76	20·04
1876	2·68	2·62	13·18	10·13	3·35	66·74	1·64	18·46	40·12	6·52	18·60
1877	0·71	1·07	8·06	5·83	2·58	66·21	4·93	17·18	40·59	3·51	18·19
1878	1·06	1·71	11·44	8·39	1·58	66·92	2·12	18·13	41·61	5·06	13·16
1879	0·44	0·73	18·34	13·77	2·27	65·45	0·93	16·15	43·12	5·25	13·01
1880	0·38	0·87	1·64	1·39	0·66	72·22	4·81	22·93	38·50	5·98	17·96
1881	1·27	2·60	5·37	4·21	1·32	68·63	3·05	21·62	39·69	4·27	26·50

NOTE.—The cholera death-rates among the civil population of the whole province for the three years 1874-76 were per mille of population in 1874, 0.94; in 1875, 1.80; and in 1876, 3.27.

No. VI.—STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the Bengal Province for the Twenty Years* 1862 *to* 1881.

Districts.	Stations.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Burdwan . .	Burdwan . .	74·00	60·50	54·85	52·60	56·35	54·90	74·10	40·60	40·54	67·13	42·47	58·67	61·44	56·66	50·63	50·53	62·22	40·06	61·00	69·13
Bankura . .	Bankura . .	61·80	55·69	48·40	60·65	66·80	48·52	62·25	50·60	42·25	61·48	44·41	47·34	49·91	47·50	70·15	54·83	54·83	47·89	76·73	73·27
Beerbhum. .	Suri. . . .	53·21	53·21	53·21	53·21	53·21	55·80	41·25	76·30	60·19	61·41	50·94	53·45	69·80	64·63	59·07	57·56	63·41	49·03	56·96	56·36
Midnapore .	Midnapore .	78·44	47·78	67·10	92·20	113·60	59·67	72·50	40·60	47·23	72·02	55·59	44·82	54·25	53·28	67·62	49·38	47·95	38·96	59·33	70·17
Hooghli . .	Hooghli . .	63·19	63·19	42·54	64·00	74·05	54·50	115·95	57·81	58·02	76·69	51·01	39·66	40·37	53·01	40·82	56·37	89·30	41·43	54·87	64·75
Calcutta . .	Observatory	73·48	61·15	84·22	61·58	65·74	72·73	91·49	62·00	60·26	93·31	51·05	45·27	61·48	59·89	80·23	60·96	62·67	43·51	69·46	69·58
Howrah . .	Howrah . .	65·96	65·96	65·96	65·96	65·96	65·96	85·00	71·30	54·38	93·23	47·69	47·57	51·23	59·89	65·95	61·86	62·33	43·35	66·84	67·20
24-Pergunnahs	Alipore . .	61·76	61·76	61·76	61·76	61·76	61·76	61·76	61·76	53·17	97·47	48·79	44·89	60·63	57·16	82·09	63·53	65·34	44·67	73·56	63·49
Nuddea . .	Krishnagarh .	55·45	46·00	46·10	66·20	48·10	57·50	79·80	55·45	43·63	60·58	42·07	46·80	49·12	54·70	65·42	70·31	65·92	54·63	69·52	68·17
Jessore. . .	Jessore. . .	91·50	64·02	64·02	64·02	64·02	64·02	84·02	58·59	61·07	83·00	69·41	45·25	52·97	63·82	76·91	68·14	71·32	56·54	75·04	62·37
Murshidabad.	Berhampore .	55·05	47·94	53·06	51·30	54·08	44·81	61·87	66·41	56·64	69·07	65·62	31·51	49·71	54·60	63·03	63·49	68·92	62·39	70·48	46·46
Dinagepore .	Dinagepore .	69·10	96·60	73·70	88·10	70·80	70·40	66·98	112·05	96·93	70·46	75·79	43·53	79·29	43·60	66·55	66·87	79·81	86·89	76·66	60·32
Maldah . .	Maldah . .	51·12	40·82	37·14	57·66	48·83	56·30	43·31	54·99	53·55	62·69	52·51	27·26	68·76	54·40	56·42	73·88	56·43	71·58	59·80	59·53
Rajshahye .	Rampur Baulia . .	77·10	59·60	59·50	60·00	57·10	51·50	71·52	65·50	47·10	71·51	54·08	32·14	56·04	49·00	76·66	78·02	73·02	86·88	68·72	59·53
Rungpore . .	Rungpore . .	69·65	85·56	85·56	85·56	85·56	85·56	84·00	99·20	113·26	94·15	86·25	44·64	94·57	60·45	65·69	91·03	121·65	108·98	79·70	68·46
Bogra . . .	Bogra . . .	84·63	84·30	95·90	79·60	62·40	103·90	73·00	90·10	83·05	92·99	66·88	37·13	85·82	57·81	68·32	75·90	82·03	71·79	77·74	70·74
Pubna . . .	Pubna . . .	69·20	69·20	69·20	69·20	47·27	96·11	77·15	86·10	61·93	82·52	59·38	45·26	54·68	50·08	70·47	98·96	76·11	54·69	81·19	68·40
Darjiling . .	Darjiling . .	121·34	121·34	121·34	121·34	121·34	121·34	135·34	100·58	146·72	117·00	107·46	77·16	125·00	115·17	116·63	105·64	116·18	160·92	128·83	110·77
Julpaiguri. .	Julpaiguri .	131·03	131·03	131·03	131·03	131·03	131·03	131·03	162·03	162·87	91·86	126·00	88·31	147·58	106·59	113·01	94·33	142·95	135·48	137·50	124·28
Dacca . . .	Dacca . . .	93·91	56·15	91·79	76·04	65·56	50·21	76·78	75·65	65·25	81·90	64·40	64·40	52·19	59·42	76·46	88·07	82·04	74·80	112·64	79·06
Furridpore .	Furridpore .	72·97	72·97	72·97	72·97	72·97	72·97	72·97	72·97	72·97	93·43	53·35	50·57	67·00	68·51	71·11	96·72	67·27	64·60	81·18	66·27

Backergunge .	Barisal . . .	69·74*	69·74*	69·74*	69·74*	69·74*	69·74*	64·50	63·76	66·80	96·24	83·14	62·11	68·04	68·02	78·35	88·01	73·67	55·63	84·16	99·26	
Mymensingh .	Mymensingh .	96·64*	96·64*	119·30	134·00	95·30	110·02	98·17	99·55	81·90	111·09	86·36	62·00	73·34	80·13	90·17	115·32	104·05	80·77	102·16	86·56	
Chittagong .	Chittagong .	103·27*	103·27*	112·25	88·39	87·51	136·62	154·05	105·11	93·52	105·17	88·53	86·39	83·09	135·72	96·45	124·98	102·64	95·31	116·60	95·76	
Noakholli . .	Noakholli . .	77·00	82·96	91·56	96·15	102·90*	97·72	81·89	83·24	106·62	132·83	110·10	118·90	105·56	119·81	159·45	122·47	105·97	115·88	125·85	139·00	
Tipperah . .	Comillah . .	112·25	86·45	98·10	106·25	79·10	102·23	82·75	87·10	77·51	98·15	81·81	73·49	72·36	89·30	99·87	103·70	87·73	80·30	100·04	101·50	
Patna . . .	Patna . . .	38·01*	38·01*	38·01*	38·01*	38·01*	38·01*	26·02	44·91	35·70	59·46	31·17	30·54	49·68	45·38	37·50	31·84	40·65	44·73	59·70	61·98	
Gya	Gya	42·59*	42·59*	42·59*	42·59*	42·59*	64·58	27·71	48·64	39·15	48·73	32·13	35·57	45·90	38·25	45·90	44·28	44·36	44·51	45·98	48·92	
Shahabad . .	Arrah . . .	41·78	61·19	20·32	39·14	41·85	51·95	27·44	48·70	48·33	61·49	35·53	37·80	54·78	33·06	21·93	28·69	38·21	46·87	50·40	45·49	
Tirhut . . .	Mozufferpore.	28·00	31·50	43·37*	43·37*	43·37*	61·00	27·00	39·50	81·30	79·02	50·57	29·06	43·99	32·61	53·71	28·33	35·41	60·39	48·72	41·53	
Sarun . . .	Chaprah . .	27·87	56·26	29·52	34·34	29·99	76·24	27·13	33·73	42·96	71·67	38·48	33·88	42·07	32·44	35·14	27·52	29·18	49·60	55·82	37·78	
Chumparun .	Motihari . .	49·80	56·90	56·80*	56·80*	56·80*	49·20	25·60	23·74	62·88	58·53	50·29	41·24	50·36	47·93	49·90	27·73	40·23	55·97	35·41	57·06	
Monghyr . .	Monghyr . .	40·45	40·85	41·92	36·80	45·55	43·52	32·74	37·43	70·72	58·02	41·26	37·72	59·59	46·51	54·30	39·79	47·79	64·82	45·84	47·77	
Bhagulpore .	Bhagulpore .	51·14	42·26	49·80	64·85	79·20	48·65	49·39	42·47	40·34	39·62	33·98	28·92	50·78	36·47	62·14	51·44	49·57	51·05	36·40	42·67	
Purneah . .	Purneah . .	66·95*	66·95*	66·95*	66·95*	66·95*	66·95*	66·95*	66·95*	66·95*	66·95*	80·33	60·21	39·22	73·56	44·16	64·85	55·56	64·37	131·39	63·64	68·94
Rajmahal . .																						
Sonthal . .	Nya Dumka .	55·97*	55·97*	55·97*	55·97*	55·97*	55·97*	55·97*	55·97*	55·97*	55·97*	61·55	49·28	52·91	60·25	55·33	63·11	64·98	59·58	61·40	67·24	66·87
Cuttack . .	Cuttack . .	52·81	65·05‡	47·60‡	51·40‡	60·95‡	50·75	52·81	48·14	49·92	50·39	71·16	38·61	86·74	91·92	41·28	41·13	54·57	60·62	67·06	59·33	
Poori . . .	Poori . . .	136·10‡	60·90	39·80	36·30	77·20	70·00	50·97	44·87	43·44	56·32	75·14	57·72	61·78	64·16	34·93	35·15	54·66	53·57	77·58	49·83	
Balasore . .	Balasore . .	111·90	86·80	64·80	52·60	68·25	67·72	77·00	49·77	54·77	63·41	71·29	48·35	55·19	60·05	82·72	67·40	61·89	49·62	74·33	79·71	
Hazaribagh .	Hazaribagh .	52·40*	52·40*	52·40*	52·40*	52·40*	52·51	49·31	48·38	59·17	56·13	35·10	59·14	60·21	43·52	44·05	45·54	43·36	44·35	53·07	49·67	
Lohardugga .	Ranchi . . .	36·20	32·20	38·30	38·65	45·15	41·25	45·69	40·38	54·53	61·53	48·99	49·95	60·25	59·03	60·93	59·28	47·80	48·76	53·43	54·48	
Singbhum . .	Chaibasa . .	52·29*	52·29*	52·29*	52·29*	52·29*	52·29*	52·29*	49·23	53·48	58·56	51·16	38·79	58·29	63·76	61·26	67·76	50·75	47·67	67·70	70·13	
Manbhum . .	Purulia . .	44·93‡	44·93‡	44·93‡	44·93‡	44·93‡	37·37	43·10	49·11	47·43	61·01	48·22	42·00	49·29	53·18	65·06	61·71	61·11	34·58	61·43	59·66	

* Average. From "Report on Food-Grain Supply and Statistical Review of the Relief Operations in the Distressed Districts of Behar and Bengal during the Famine of 1873–74," by A. P. MacDonnell, of the Bengal Civil Service.

† Alipore. The average of five years from 1871 to 1875 inclusive.

‡ Poori. From "Report of the Commissioners appointed to inquire into the Famine in Bengal and Orissa in 1866."

NOTE.—For all the other stations the rainfall is taken from the records furnished by H. Blanford, Esq., Meteorological Reporter with the Government of India.

Referring the reader to these tabular statements for details, I proceed to notice very briefly the cholera history of the successive years in their order.

1862.—In this year cholera, though generally diffused over the province, appears to have prevailed with the ordinary frequency of non-epidemic years. The year 1862 was the third of the triennial cycle 1860–62, and as such was due in the normal course to be the year of minimum cholera prevalence in its cycle. The cholera death-rate of the year among the troops and jails taken together was 5.73 per mille of strength. Among the European troops the death-rate was 5.62, and of the 9 stations occupied by them 6 recorded cholera. Of the 38 admissions (see Table No. III.) 31, and of the 27 deaths 25, occurred in the Presidency Hospitals, Chinsurah Depot, and Fort William, out of a total average strength of 1283. Of the 38 admissions, there were 2 in January, 1 in February, 5 in March, 9 in April, 5 in May, 5 in July, 6 in November, and 5 in December.

Among the Native troops the death-rate was 3.04, and of the 8 stations occupied by them 5 recorded cholera. Of the 41 admissions 28, and of the 14 deaths 11, occurred at Calcutta, Alipore, and Barrackpore; the rest occurred at Berhampore and Dinagepore. Of the admissions, 2 were in January, 4 in February, 5 in March, 5 in April, 1 in May, 8 in June, 2 in September, 3 in October, 8 in November, and 3 in December.

Among the jail populations the death-rate was 6.58, and of the 45 jails in the province 27 recorded cholera. Of the 367 admissions 182, and of the 101 deaths 32, occurred in the Hooghli and Alipore jails—total average strength, 2511. The Rajshahye, Monghyr, and Bhagulpore jails—total average strength 1007—contributed together another 81 admissions and 30 deaths. Burdwan,, Backergunge, Rajmahal, strength 1089, contributed 41 admissions and 22 deaths. Furridpore, Dacca, and Patna, strength 1272, contributed in equal shares 30 admissions and 8 deaths (Dacca only 2). In none of the other jails affected did the admissions exceed 7 in number. Of the admissions, there were 6 in January, 5 in February, 55 in March, 157 in April, 14 in May, 11 in June, 26 in July, 36 in August, 13 in September, 22 in October, 17 in November, and 5 in December.

The rainfall of the year 1862 was abundant, and nearly three inches above the average; it was also seasonably distributed (see Table No. V.) Food-supply in this year was unusually abundant and cheap.

1863.—In this year, the first of a new triennial cycle, cholera broke out into revived epidemic activity. The death-rate among the troops and jails together rose to 14.09 per mille of strength from 5.73 in the preceding year. The incidence of the disease was most heavy upon the jail populations, and the high mortality among them may be taken as an approximate index to the rate of cholera prevalence in this year among the masses of the civil population.

Among the European troops the death-rate was only 3.89 against 5.62 in the preceding year, and of the 8 stations occupied by them all recorded cholera. There were altogether 20 admissions and 16 deaths. Of the admissions, there were 1 in February, 2 in March, 4 in April, 1 in June, 4 in July, 1 in August, 1 in September, 2 in October, 3 in November, and 1 in December.

Among the Native troops the death-rate was 3.07 against 3.04 in the year before, and of the 10 stations occupied by them 5 recorded cholera. There were altogether 55 admissions and 20 deaths, viz.:—Fort William,

strength 646, admissions 21 and deaths 8; Barrackpore, 1202, 20 and 10; Dinagepore, 670, 9 and 1; Chittagong, 485, 1 and 1; and Julpaiguri, 1085, 4 and 0 respectively. Of the admissions, there were 1 in January, 1 in February, 2 in March, 7 in April, 4 in May, 16 in June, 3 in July, 10 in August, 8 in September, and 3 in October.

Among the jail populations the death-rate rose to 22.29 from 6.58 in the preceding year. There were altogether 1007 admissions and 335 deaths, and of the 46 jails in the province 37 recorded cholera. The jails that suffered most severely were Backergunge, strength 570, admissions 105 and deaths 51; Alipore, 1817, 75 and 13; Hooghli, 571, 86 and 28; Mymensingh, 543, 35 and 11; Purneah, 478, 215 and 81; Hazaribagh, 392, 34 and 15; Monghyr, 380, 72 and 39; Bhagulpore, 375, 39 and 10; Gya, 435, 36 and 9; Patna, 436, 71 and 19; Arrah, 486, 26 and 10; Mozufferpore, 423, 80 and 16; and Chaprah, 388, 45 and 13 respectively. Of the admissions, there were 7 in January, 23 in February, 378 in March, 108 in April, 107 in May, 45 in June, 118 in July, 74 in August, 32 in September, 21 in October, 56 in November, and 38 in December.

The rainfall of the year 1863 was considerably less than that of the year before, and it was also somewhat below the average fall. The average fall in the first and last quarters was markedly in defect as compared with the fall in the same periods of 1862, viz., 1.67 inches against 2.43 and 4.31 inches against 8.98 respectively. In the second and third quarters the fall was much the same in both years. The average price of food in the province as a whole was much the same in both years, but there was great variation in the current rates in different districts; the prices in the districts which suffered most severely generally ranging very high.

1864.—As a result of the recommendations of the Royal Commission appointed to inquire into the sanitary state of the army in India in 1859, the Sanitary Commission of Bengal was instituted in 1864, and for the first time measures were taken for the systematic registering of deaths in Calcutta; but the results were of so imperfect a kind as to be useless for statistical purposes. The only class of the Native population for which any reliable statistics of the prevalence of cholera in 1864 are available is that of the prisoners in the jails; and the troops of the Native army also furnish statistics in the same direction. From these, and the records of the incidence of the disease among the European troops, it appears that the cholera of 1864 in the Bengal Province was a decidedly abating cholera as compared with the epidemic prevalence of the preceding year. The death-rate for the troops and jails combined fell to 9.36 per mille of strength in 1864 from 14.09 per mille in 1863.

Among the European troops the death-rate was 2.32 per mille in 1864 against 3.89 in 1863. There were altogether 20 admissions and 10 deaths, and of the 8 stations occupied by them 4 recorded cholera, viz.:—The Presidency (including Fort William, Kidderpore Hospital, and Chinsurah Depot), Damdam, Barrackpore, and Dinagepore. Of the admissions, there were 3 in February, 1 in March, 5 in April, 1 in May, 5 in July, 1 in August, 2 in October, and 2 in December.

Among the Native troops the death-rate in 1864 was 4.80 against 3.07 in 1863. There were altogether 89 admissions and 38 deaths, and of the 12 stations occupied by them 7 recorded cholera, viz.:—Fort William, strength 388, admissions 16 and deaths 6; Alipore, 576, 8 and 3; Barrackpore, 1341, 8 and 3; Dacca, 584, 40 and 21; Bhutan Field Force, 1922, 7 and 3; Julpaiguri, 883, 5 and 1; and Dinagepore, 587, 5 and 1 respectively.

Of the admissions there were 2 in March, 13 in April, 30 in May, 9 in June, 5 in July, 5 in August, 2 in September, 5 in October, 14 in November, and 4 in December.

Among the jail populations the death-rate in 1864 fell to 13.69 per mille from 22.29 in 1863. There were altogether 615 admissions and 210 deaths, and of the 45 jails in the province 34 recorded cholera. The jails which suffered most severely were—Alipore, strength 1793, admissions 69 and deaths 17; Jessore, 489, 47 and 22; Hooghli, 451, 28 and 7; Bankura, 395, 42 and 16; Rajmahal, 169, 35 and 14; Dinagepore, 462, 84 and 37; Rajshahye, 394, 63 and 18; Pubna, 141, 26 and 10; Backergunge, 495, 44 and 17; Bhagulpore, 359, 57 and 10; and Patna, 467, 28 and 8· respectively.

As in the two preceding years, the cholera of 1864 was also very generally diffused throughout the province. From the returns of deaths registered in Calcutta during the last nine months of 1864, it appears that a total of 2975 deaths were attributed to cholera out of a population estimated at about 450,000. Of these deaths, 2169 were of males and 806 of females; 121 occurred among Christians, 92 males and 29 females; 2177 among Hindoos, 1562 males and 615 females; and 677 among Muhammadans, 515 males and 162 females. It has been shown by Dr. Hugh Macpherson that during the twenty years ending 1860 cholera has never been absent from Calcutta. The incidence of the cholera of 1864 among the troops and jails in the Bengal Province was much on a par with that of the year 1861. The figures representing cholera admissions among the troops and jails in the Bengal Province in each year from 1861 to 1864 inclusive are as follows:—

Years.	Troops.	Jails.	Total.
1861	162	588	740
1862	79	367	446
1863	75	1007	1082
1864	109	615	724

The figures for the troops include both Europeans and Natives.

The rainfall of 1864 was somewhat less than that of 1863, but the fall in the first and last quarters was proportionately heavier in 1864 than in 1863 during the same periods (see Table No. V.) The average price of rice —the staple food-grain—was considerably dearer in 1864 than in 1863 in many parts of the province, and the general average price was 24.80 sers the rupee against 26.24 sers the rupee in 1863, and 26.82 sers in the year before that.

1865.—The cholera of this year was again an abating cholera, notwithstanding that food was generally dear and there was local distress from high prices in many of the districts. The death-rate among the troops and jails fell to 6.97 per mille of strength from 9.36 in the preceding year, and 14.09 in the year before that. In 1862 the death-rate was 5.73—a minimum rate, as was due for that year, the last of the triennial cycle 1860–62. The death-rate among the troops and jails for 1865 appears to have been raised somewhat above the ordinary figure for that year by the heavy incidence of the disease among the troops employed in the Bhutan campaign during that period.

Among the European troops the cholera death-rate in 1865 rose to 3·37

per mille of strength from 2.32 in 1864. There were altogether 24 admissions and 17 deaths, and these were contributed by 6 out of the 9 stations occupied by them, viz. :—Fort William, strength 789, admissions 1 and deaths 1; Damdam, 717, 13 and 10; Barrackpore, 357, 1 and 1; Berhampore, 147, 1 and 1; Bhutan Field Force, 145, 5 and 3; and Dinagepore, 1062, 3 and 1 respectively. Of the admissions, there were 1 in March, 1 in April, 15 in May, 1 in July, 1 in October, 1 in November, and 3 in December.

Among the Native troops the death-rate in 1865 rose to the exceptionally high figure of 15.81 per mille from 4.80 in 1864. There were altogether 275 admissions and 150 deaths, and these were contributed by 5 out of the 8 stations occupied by them, viz. :—Calcutta, strength 1287, admissions 38 and deaths 17; Barrackpore, 778, 12 and 8; Dacca, 466, 24 and 8; Bhagulpore, 358, 10 and 5; and Bhutan Field Force, 5084, 191 and 113 respectively. Of the admissions, there were 2 in January, 9 in February, 7 in March, 67 in April, 81 in May, 42 in June, 10 in July, 8 in August, 9 in September, 10 in October, 24 in November, and 6 in December.

Among the jail populations the death-rate in 1865 fell to 8.94 per mille from 13.69 in 1864 and 22.29 in 1863. There were altogether 415 admissions and 155 deaths, and of the 46 jails in the province 30 recorded cholera, thus showing a very general diffusion of the disease. The jails which suffered most severely were—Alipore, strength 1811, admissions 66 and deaths 25; Bankura, 480, 30 and 8; Purneah, 420, 44 and 23; Patna, 433, 33 and 14; Digah, 419, 36 and 15; and Chaprah, 484, 73 and 24. Of the admissions there were 5 in January, 7 in February, 22 in March, 138 in April, 23 in May, 21 in June, 41 in July, 24 in August, 21 in September, 74 in October, 36 in November, and 3 in December.

The rainfall of 1865 was an average fall, and about 2 inches more than that of 1864. The fall in each of the first two quarters was proportionally more abundant than the fall in the other two quarters, whilst in the last quarter the fall was decidedly in deficiency as compared with the falls measured in the same quarter of the three preceding years. The local distribution of the rainfall, however, varied greatly, as will be seen by reference to Table No. VI. There was a steady and rapidly increasing rise in the price of food during 1865; the price of rice rose to 18.98 sers the rupee from 24.80 sers in 1864 and 26.24 sers in 1863.

1866.—After two years of steadily abating prevalence, cholera in this year again broke out in revived epidemic activity, and prevailed with greatly aggravated severity. The death-rate among the troops and jails, taken together, rose to the exceptionally high figure of 20.96 per mille of strength, by far the highest death-rate in any year of the whole series dealt with in this investigation. The bulk of the mortality was contributed by the jail populations, and the death-rate among them may be taken as an approximate measure of the incidence of the disease among the general civil population of the province, among whom the famine distress of this year pressed with greater severity than among the troops.

Among the European troops the death-rate rose to 4.11 per mille from 3.37 in 1865. There were in all 28 admissions and 18 deaths, and 5 out of the 9 stations occupied by them recorded the presence of the disease, viz. :—Fort William, strength 861, admissions 4 and deaths 2; Damdam, 680, 3 and 2; Darjiling, 491, 1 and 1; Hazaribagh, 806, 19 and 13; and Dinagepore, 892, 1 and 0 respectively. Of the admissions, there were 1 in February, 1 in March, 1 in April, 2 in May, 5 in July, 14 in August, and 4 in September.

Among the Native troops the death-rate in 1866 fell to 5.44 per mille from the extraordinarily high rate of 15.81 per mille in 1865, the year of the Bhutan campaign. In all, there were 93 admissions and 50 deaths, and these were contributed by 7 out of the 12 stations occupied by them, viz. :— Calcutta, strength 1287, admissions 77 and deaths 43; Barrackpore, 778, 5 and 3; Dacca, 466, 4 and 1; Bhagulpore, 358, 3 and 2; Dorunda, 551, 1 and 0; Dinagepore, 626, 2 and 1; and Sagaoli, 338, 1 and 0 respectively. Of the admissions, there were 5 in January, 8 in February, 19 in March, 15 in April, 16 in May, 9 in June, 8 in July, 6 in August, 2 in September, 2 in November, and 3 in December.

Among the jail populations the death-rate in 1866 rose to the exceptionally high figure of 32.28 per mille of strength, by far the highest death-rate recorded among this class in any year of our series of twenty, and only approached by that of 1863, in which year it was 22.29 per mille. There were altogether 1415 admissions and 617 deaths, and these were contributed by 39 out of the 45 jails in the province. The jails which suffered most severely were—Alipore, strength 1904, admissions 86 and deaths 24; Hooghli, 642, 41 and 17; Midnapore, 814, 42 and 23; Balasore, 564, 89 and 37; Cuttack, 856, 216 and 113; Chaibasa, 228, 136 and 84; Hazaribagh, 689, 154 and 76; Bhagulpore, 341, 46 and 16; Patna, 571, 47 and 18; Digah, 605, 78 and 28; Arrah, 492, 88 and 32; Mozufferpore, 457, 74 and 17; and Chaprah, 499, 82 and 19 respectively. Of the admissions, there were 5 in January, 51 in February, 149 in March, 72 in April, 90 in May, 207 in June, 396 in July, 303 in August, 70 in September, 28 in October, 27 in November, and 37 in December.

The rainfall of 1866 was about the same in quantity as that of 1865; the seasonal distribution was also much the same in the first and third quarters of both years; but in the second and last it was different in the two years, being somewhat less in 1866 in the former, and considerably more in the latter. The price of rice had risen to famine rates, and in many districts the distress for food was very severe.

It is recorded that the cholera of 1866 was generally prevalent throughout Bengal Proper.

"It was confined to no particular season, but was generally most severe in January, and again in the end of the year. The time at which it appears to have reached its height varied, however, in different districts. In Balasore, for example, it prevailed from January to June; in Monghyr the most severe epidemic was in August. Throughout the famine tracts it raged with much virulence, and to this disease, with dysentery and diarrhœa, a great part of the lamentable mortality is to be ascribed." In the opinion of Dr. Sheridan, the civil surgeon of Birbhum, the extraordinary causes which favoured the spread of these diseases, and which were in operation over great part of the province, were—"1st. A great dearth of food among the people, owing to a failure in the rice crop, amounting in some parts of the district to actual famine and starvation. . . . 2d. Bad drinking-water, owing to the early cessation of the rains in September and the long-protracted drought which followed, continuing up to the first fall of rain in the middle of June, in consequence of which all the tanks of moderate depth became partially or wholly dried up, rendering any water remaining in them impure and unfit for drinking. . . . 3d. Exposure to vicissitudes of weather and extremes of temperature at the most inclement and unhealthy seasons of the year, owing to the inability from extreme poverty to procure warm clothing or covering. Want of shelter, too, on the part of large numbers of the poor, whose miserable huts had been destroyed by the unusually heavy falls of rain which occurred in the months of June and July; and where not totally destroyed, inability to rethatch fallen-in roofs owing to the great scarcity and dearness of straw. 4th. Inundations from the overflowing of the rivers, which caused great loss and damage to large numbers living near them, in many instances destroying the small quantities of grain that had been rescued from the previous year's scanty harvest. 5th. Consumption of new rice by large numbers who had been for months previous suffering from chronic starvation."

The Sanitary Commissioner for Bengal writes—"Most of the medical officers from whom replies have been received have expressed their belief that cholera, as it came under their observation, has not been propagated by contagion. They generally ascribe it to local causes, the precise nature of which we have yet to ascertain. The force and direction of the wind have not been observed to influence its spread." The civil surgeon of Dacca, in which district the disease was more than usually severe in 1866, and caused the death of 3000 persons, remarks—"It is certain that its course was not directed by the wind, but by the khalls (canals) and roads." The civil surgeon of Dibrugarh, in Assam, states "that the disease moved up to that district from Bengal in direct opposition to the N.E. wind."

The Meteorological Reporter for Bengal having only recently, on the creation of that appointment and office, entered on his duties, no information (reports the Sanitary Commissioner for Bengal) is available from his office regarding the meteorological phenomena of 1866. The following statement is compiled from the data contained in the sanitary reports of civil surgeons regarding temperature and rainfall of 1866 as compared with previous years. The stations have been selected as illustrating different portions of the large extent of country embraced in Bengal, and because the observations have been recorded by the medical officers themselves.

STATEMENT *showing Mean Temperature and Rainfall in certain Stations of Bengal Proper for* 1866 *as compared with the Average of Previous Years.*

Months.	Dibrugarh.				Jessore.				Poori.				Midnapore.				Bhagulpore.				Shahabad.			
	Mean Temperature, 1866.	Average Mean of Previous Years.	Rainfall, 1866.	Average of Previous Years.	Mean Temperature, 1866.	Average Mean of Previous Years.	Rainfall, 1866.	Average of Previous Years.	Mean Temperature, 1866.	Average Mean of Previous Years.	Rainfall, 1866.	Average of Previous Years.	Mean Temperature, 1866.	Average Mean of Previous Years.	Rainfall, 1866.	Average of Previous Years.	Mean Temperature, 1866.	Average Mean of Previous Years.	Rainfall, 1866.	Average of Previous Years.	Mean Temperature, 1866.	Average Mean of Previous Years.	Rainfall, 1866.	Average of Previous Years.
January.	55·0	61·0	7·40	1·50	67·33	65·89	...	0·19	78·1	71·62	...	0·11	71·3	68·2	1·2	0·40	63·0	62·0	2·10	0·30	64·5	65·0	0·70	...
February	60·0	61·0	3·0	2·87	70·33	71·56	...	0·06	76·62	76·98	3·9	1·15	71·4	73·51	5·5	2·45	67·9	71·0	3·0	0.80	63·5	68·0	2·0	0·50
March . .	68·0	71·0	5·20	5·32	83·66	80·03	...	1·6	83·18	80·68	...	0·57	85·8	80·8	1·4	1·95	84·0	79·0	...	1·50	83·0	80·0	...	1·85
April . .	70·0	74·0	4·70	9·68	81·66	83·63	...	4·3	84·34	83·71	6·0	0·42	87·5	87·5	7·8	2·50	82·0	85·0	4·50	3·60	88·5	86·5	0·95	2·28
May . . .	75·0	78·0	15·30	14·52	84·33	83·79	...	11·8	86·98	85·90	2·6	2·87	90·3	87·9	12·7	12·40	89·5	84·5	0·10	6·10	89·5	87·5	...	3·92
June. . .	83·0	82·0	20·30	18·26	84·66	83·90	15·4	12·7	86·93	84·40	6·2	9·86	89·6	88·6	16·5	10·60	90·5	87·0	20·40	8·20	93·5	94·0	6·50	2·45
July . . .	80·0	82·0	30·0	17·22	82·33	83·76	7·2	14·6	85·59	84·19	6·7	10·48	86·2	85·9	17·4	14·40	85·0	85·5	11·40	17·70	86·0	94·5	12·85	19·85
August .	80·0	80·0	22·30	14·58	84·00	83·16	9·3	12·5	83·84	83·65	28·6	15·06	84·7	85·3	22·6	13·20	86·0	87·0	12·20	16·0	84·0	95·5	12·95	5·70
Sept. . .	79·0	79·0	16·50	11·43	83·25	83·96	9·7	8·8	84·66	83·88	12·1	14·87	84·6	85·1	17·7	13·50	85·0	85·0	13·70	11·70	83·0	90·0	5·25	2·10
October .	73·0	74·0	14·80	8·18	80·30	80·93	11·7	6·9	82·97	82·43	11·1	9·84	81·8	83·2	10·6	2·30	80·0	81·0	4·80	4·50	77·5	79·5	0·90	...
November	67·0	66.0	...	1·83	72·57	74·49	...	0·7	78·05	77·49	...	2·9	75·6	76·4	...	0·90	71·5	71·0	...	...	67·5	79·5	...	...
December	57·0	61·0	...	1·20	64·10	67·13	...	0·4	71·99	71·54	...	0·31	71·1	71·1	...	...	61·5	65·0	...	0·60	59·0	69·0	...	0·50
Totals .	70·5	72·12	139·50	106·59	78·21	78·47	53·3	74·55	81·93	80·53	77·2	67·63	81·6	81·1	113·4	74·60	78·8	78·5	72·20	71·00	78·2	82·4	42·10	39·14

Regarding food-supply, it is stated that in Bengal rice boiled in water forms the principal article of diet of the people, and in many cases the only food taken.

Dâl, fish, and vegetables are added to give relish and flavour to it. The ordinary daily allowance of rice for a healthy man is 12 chittaks or 1½ lb. Boatmen and others often consume 14 chittaks. Wheat is not generally used by Bengalis, except in sweetmeats. The Muhammadans in the towns consume fermented bread, prepared by professional bakers. Various kinds of cakes and biscuits are sold. Natives of Hindustan generally fall into the habits of the Bengalis, and make rice the chief article of their diet. Those, however, who can afford it cook chappatis or unfermented bread. Muhammadans eat all sorts of meat, with the exception of swine. Hindus use animal food very sparingly. Goats' flesh can be eaten, also pigeons, ducks, and their eggs, without losing caste. The poor often eat turtle also. About 2 chittaks of dâl form an ingredient of almost every meal. The poor, being unable to buy both dâl and fish on one day, generally take them alternately. Milk, simply boiled or acidulated (dahi), is much used. Butter is not esteemed. Ghi (boiled or clarified butter) is universally employed in cooking vegetables and dâl, which are eaten with the rice. Sweetmeats are always fried in ghi. Rice and milk, with sugar (parmanun) and spices added, is considered a great delicacy, and forms the last dish of the meal. This, however, is only partaken of on rare occasions. Native vegetables are generally cooked with ghi, mustard oil, or a mixture of it and til (sesamum) oil, salt, capsicum, acid fruits, nim leaves, &c. Every native adds about six drachms of salt to his meal. The poorer classes add a "mixture" consisting of turmeric, laurel leaf, chillies, cummin; occasionally onion, garlic, and coriander enter into the composition of the seasoning.

Fish of endless variety are sold in the bazars. They are cheapest during the cold season, scarce and expensive during the rains.

Fish are generally fried in oil, with salt, turmeric, and spices, and are eaten along with rice and vegetables. The mango is held in the highest estimation during the season; no meal is considered complete without it. Kathal or jack-fruit is the next in popularity. It is eaten raw, or its juice is mixed with milk, and drunk in the hot weather. The cocoa-nut is much prized. The date is small and tasteless; from its juice, however, molasses is made. Bael is chiefly used in the form of sherbet. Plantains are highly valued, and are a favourite viand. The sour plums of the *ber* (*Zizyphus jujuba*) are much sought after by the poorer classes. Oranges and sweet limes are imported from Sylhet, and are largely consumed. In July pine-apples sell as cheap as two for one pice. Papaya, guava, cucumber, water-melon, &c., find a ready sale. The Singhara nuts (water-caltrops), though less common than in Hindustan, sell here at two pice a ser; large quantities are sold towards the beginning of the cold season. (From the Report of Dr. Wise, civil surgeon of Dacca.)

Throughout the year 1866 the price of food ruled high in Bengal. In Orissa a grievous famine desolated the land. In Midnapore and throughout Behar there was great scarcity, and consequently much distress among the people. In districts where a full harvest had been gathered, exportation of rice to the famine districts produced high prices in them also. In Dacca, for example, the crops of 1866 are reported on the whole to have been good, and yet famine prices prevailed during several months of the year. The following tabular statement shows the enormous rise in the price of rice in this district—"a rise which must have terribly curtailed the food of the poor." The three common kinds of rice in former years sold as follows in comparison with the prices in 1866. The figures denote the number of sers per rupee in the several months specified.

Kinds of Rice.	In former years.	In 1866.					
		May, June, and July.	August.	September.	October.	November.	December.
Table. . . .	14	6	5½	6½	5½	6	6
Urwa. . . .	30	8	8	8	8	11	13
Sehla. . . .	40	19	8	9	9	5	17

Regarding the rainfall, it is stated that the rains of 1865, throughout the lower provinces of Bengal, ceased prematurely in the middle of September.

"Speaking generally, it may be said that no rain of any consequence fell after the middle of that month. A portion of the Madras coast to the south-west of Bengal was also similarly affected. The total quantity of the rainfall for the year was not unusually small in most of the districts of Bengal, but it fell abnormally and out of time. Much rain fell early in the season, before the usual time for sowing had arrived, and when its continuance could not be depended on; while the latter rains, which are usually expected in the end of September and October, failed. Speaking still in general terms of the countries on the northern coast of the Bay of Bengal, it may be said that the rains, brought by the south-west monsoon, commence earlier, and fall in greater quantity and more regularly to the east, and diminish both in quantity and still more in regularity towards the west; so that the eastern countries are altogether more humid than those to the west. Rice is the staple of all these countries. And the same crop which in the more humid districts of the east ripened in 1865, notwithstanding the unusually early cessation of the rains, was prematurely cut off in the drier and tardier districts of the west; the more so as it seems that in part of Orissa the total fall was much below the average, and the period from June to the middle of September was specially deficient prior to the total cessation of rain from the last-mentioned date." (Report of the Special Commissioners on the Orissa Famine, quoted by Sanitary Commissioner for Bengal.) "During 1866 throughout Orissa the average price of rice varied from 13 sers in January to 5 sers, and even less than 5 sers in August. . . . In Behar and throughout the Sonthal Pergunnahs also famine was widely spread, and there was great distress among the people. In these parts of the country it has been computed that during 1866 no less than 135,676 persons perished from starvation, or disease engendered by want."

The famine of 1866 in Lower Bengal was confined to the districts of Orissa, in which it was the most intense, and to those of Manbhum, Singbhum, Bankura, Nuddea, Midnapore, and the 24-Pergunnahs, in which it was less severe. In Mr. Cockerell's Famine Report, Orissa, in 1866, it is stated that in Balasore cholera was very prevalent as early as February both in the town and district, and in March was committing great havoc among the poor who had flocked to the town for the food distributed by the Famine Relief Fund. The police had to remove ten or twelve corpses every morning. In 1866 famine prevailed also in Behar and the Sonthal Pergunnahs. From Mr. Cockerell's Report it appears that the famine was most severely felt in the Tirhut district, where the rice crop had failed in successive harvests since 1863. In February 1866 the villagers in the northern portion of the district, unable to cope with the ruin entailed by three successive years of drought, commenced deserting their homesteads, migrating southwards in large numbers. Distress was most severe throughout the months of July, August, and September, and the price of rice ranged between 7 sers and 5¼ sers the rupee in different parts of the district. Throughout the south of the district the pressure was comparatively slight. In August cholera appeared, and spread through several villages in the north of the district, and also at Durbhanga and Mozufferpore. "The mortality caused by the

outbreaks was necessarily very severe, and the people, being generally reduced in strength from a long course of privation, quickly succumbed to the disease. The distress continued until near the close of the year."

In the Champarun district the famine was felt most severely also in the northern part of the district along the borders of the Nepal Terai, the rice crop, which is the principal crop, having failed in 1865, though the maize crop of that year yielded a fair outturn. But this latter had been largely exported, and thus distress became general on the failure of the rice crop. In October 1865 the rate of the commonest sort of rice was 9 sers the rupee, or three times the price at which it was sold at the commencement of the year, and all other edible grains had risen in like proportion. In 1866, owing to an insufficient spring harvest, the prices went on rising and the distress increased. In February a hailstorm caused great injury to the spring crop in some villages along the line of the Gandak River in the south and south-east of the district, and subsequently early dry winds, setting in immediately after the heavy rain that fell about this time, still further injured this crop generally. In August the embankments of the main Gandak River gave way, and the flood-water, passing over the country till it joined the channel of the Smaller Gandak, laid the whole of the intervening land under water, and destroyed more or less the crops over an area of about 16,000 bigahs. "During this period there was an outbreak of cholera at Motihari; the disease does not appear to have spread, and the number of persons affected by it is stated to have been too inconsiderable to call for special measures, the medical aid available locally being found sufficient for the occasion. The mortality in this district from actual starvation and disease engendered by want of proper sustenance was excessive—not less, it was estimated, than 6 per cent. of the population, or 56,000 persons." The maize crop of 1866 was gathered in September, and proving generally very good, prices at once fell, and considerable relief was experienced.

In the Sarun district the distress, at first general from the effects of two or three bad harvests in successive years, was subsequently locally intensified by the complete destruction of crops caused by the severe hailstorm which traversed a portion of the district from west to east in February 1866. The spring crops of 1865 also sustained great injury from a hailstorm, which passed over exactly the same tract of country as that devastated by the more severe storm above alluded to, which swept a tract of country about 35 miles in length, with an average breadth of from 5 to 8 miles, from the extreme north-west corner of the district to the eastern limit, where it is bounded by the river Gandak. Distress for food became severe in the latter part of 1865, and increased during 1866, in which year cholera made its appearance in many parts of the district. "The disease, however, does not appear to have prevailed in any violent form, or to have assumed an epidemic character such as to have called for the provision of special medical aid."

In the Shahabad district the crops failed to a serious extent both in 1864 and 1865 owing to excessive drought, and on the second complete failure of the rice crop in the latter year the distress for food became very general and severe. Cholera was very prevalent in 1866, and most so in Arrah, which was crowded with people who had come for relief from the interior of the district.

In the Gya district the distress was most serious in its west and south parts. The rice crops in these parts, extending over an area of upwards

of 1300 square miles, had failed completely in 1864; and the spring crops of 1865 were much below the average, owing to the early cessation of the rains in the preceding year, and also to the damage done by the severe hailstorm which fell in the spring of 1865. From these causes the distress in May and June 1865 became so great, that the poorer classes were reduced to living on the seeds and berries of wild trees, grass, and herbs, and in October the price of rice rose to 7 sers the rupee. Towards the close of the year, on the gathering of the rice harvest, prices fell somewhat; but they rose again in the following spring, on the failure of the early crops, in consequence of the severe hailstorms and a heavy rainfall in the month of February, coupled with the premature arrival of the hot winds, and in March 1866 the distress again became severe. "About the middle of July cholera made its appearance in the town of Gya, and thence spread over the interior of the district, and prevailed in some parts of the Aurangabad division."

In the Patna district the general distress was not severe. It began to be felt among the poorer classes from the excessive rise in the price of all food in October 1865, and was more intense in the southern subdivisions, bordering on the Gya district, and in a portion of the Behar subdivision. The high prices ruling in this district were due not so much to the failure of the local produce as to previous excessive exportation and the demand for supplying the surrounding districts. "There was no epidemic disease and no unusual prevalence of sickness in any part of the district during the period of scarcity."

In the Monghyr district the most severe distress prevailed in the south-west and western parts. Owing to the failure of the rice crop in 1864, and the certainty of a repeated failure in 1865, prices rose rapidly; and in October of the latter year the market rate of the commonest sort of rice rose to 11 sers the rupee, and other edible grains became proportionally dear. "In the spring of 1866 the distress became severe, and in August cholera broke out within the tract where the famine pressed most heavily. The disease prevailed also to some extent in that part of the district which lies to the north of the Ganges. In Secundra and Shekhpura the mortality from cholera was especially severe; in Secundra the average daily deaths from cholera during the two weeks for which the disease continued in its most severe form was about 8 or 10, the largest number reported in one day being 24; at Shekhpura the disease continued with some violence for about ten days, during which the mortality is reported to have been very great."

In the Bhagulpore district the distress was most severe in the northern subdivisions bordering on Nepal territory, and in some parts lying to the south of the Ganges and west of the town of Bhagulpore, in which the rice crop had completely failed; and in the northern subdivisions the distress was enhanced by the failure of the *murooa* crop, which was almost entirely destroyed in 1865 by the prematurely heavy rainfall in the month of July. In October the price of the commonest sort of rice had risen to 11 sers the rupee; but the usual temporary relief was obtained from the rice-harvest season up to the gathering of the spring crops in April 1866, after which prices again rose, and the greatest distress prevailed. Nevertheless, it is stated—"No epidemic disease prevailed in any part of the district during the period of distress." The mortality from starvation, or disease engendered by privation, was not great in this district as compared with most of the other districts to which the report on the famine in Behar and the Sonthal

Pergunnahs refers; and it seems that the relief measures adopted were not on an inadequate scale. Notwithstanding all this, we have seen that cholera was prevalent with very considerable severity in the Bhagulpore jail, strength 341, the deaths being 16 out of a total of 46 admissions in 1866.

In the Purneah district there had been no general failure of the crops, but owing to excessive exportation during the two preceding years the grain stock of the district had been seriously reduced, and in October 1865 the price of the coarsest kind of rice rose to 12 sers the rupee. The usual improvement in prices took place as the rice harvest was gathered, and continued till April 1866, when the price of rice again rose to 12 sers the rupee. About this time the distress was relieved for several weeks by the extraordinary abundance of the mango produce. "Notwithstanding the demand for it, the fruit was so abundant that 100 mangoes continued for a long time to be sold for a single pice."

In the Sonthal district the distress did not occur until after the failure of the rice crop towards the close of 1865. "There were occasional outbreaks of cholera both at Deogarh and in the Nullah subdivision throughout the period of distress between April and October, but the disease does not appear to have been attended with very fatal results." In the Dumka division cholera broke out in September both at Dumka and Noni, and spread through the surrounding villages.

1867.—In this year there was a very marked abatement in the prevalence of cholera in the Bengal Province. The death-rate for the troops and jails fell to 7.51 per mille of their combined strength from 20.96 in the year before. This great fall in the cholera mortality of this year among these classes was mostly due to the very much milder incidence of the disease among the jail populations.

Among the European troops the death-rate fell to 1.44 in 1867 from 4.11 in 1866. There were altogether 7 admissions and 6 deaths, and they occurred in 5 out of the 9 stations occupied by these troops. Of the admissions, there were 2 in May, 1 in August, and 4 in November.

Among the Native troops the death-rate was slightly higher in 1867 than in 1866, the figures being 5.84 and 5.44 per mille respectively. Altogether there were 65 admissions and 33 deaths, and they were contributed by 6 out of the 10 stations occupied by these troops, viz.:—Fort William, strength 612, admissions 5 and deaths 2; Alipore, 1078, 25 and 9; Damdam, 645, 24 and 15; Barrackpore, 128, 1 and 0; Dinagepore, 639, 9 and 6; and Dacca, 320, 1 and 1 respectively. Of the admissions, there were 1 in January, 1 in February, 12 in March, 4 in April, 2 in May, 2 in June, 10 in July, 4 in August, 2 in September, 7 in October, 7 in November, and 13 in December.

Among the jail population the death-rate in 1867 fell to 9.56 from 32.28 in 1866, and of the 49 jails in the province 26 recorded cholera. Altogether there were 363 admissions and 162 deaths. The jails which suffered most were—Alipore, strength 2356, admissions 77 and deaths 20; Monghyr, 394, 27 and 8; Purneah, 332, 65 and 43; Patna, 533, 43 and 25; Digah, 694, 39 and 26; and Muzafferpore, 297, 12 and 6 respectively. In none of the other jails affected did the number of deaths exceed 5. Of the admissions, there were 5 in January, 2 in February, 53 in March, 57 in April, 74 in May, 4 in June, 49 in July, 20 in August, 56 in September, 9 in October, 28 in November, and 6 in December.

The rainfall of 1867 was about $2\frac{1}{3}$ inches above that of 1866, and about

2¼ inches above the average fall for the Bengal Province; it was also seasonably distributed, the several quarters of the year receiving a proportionally fair share. There was a very marked improvement also in the price of food; the average annual price of rice fell to 20.92 sers the rupee from 14.13 sers in the preceding year.

1868.—In this year again, the third of the triennial cycle 1866–68, cholera appeared in continuously abating prevalence. The incidence of the cholera of 1868 among the troops and jails in this province is shown in abstract in the tabular statements Nos. III. and IV. at the head of this section.

The cholera of 1868 in the Bengal Province was no more than the ordinary prevalence of the disease in non-epidemic years, and in point of frequency it appears, from the incidence of the disease among the troops and jails, to have fallen to the minimum severity in the triennial cycle 1866–68. This triennial periodicity in the activity, abatement, and subsidence of the cholera of the Bengal Province in the successive years respectively of each triennial cycle is very clearly marked in the army and jail returns relating to this province, as is shown in the subjoined abstract statement of admissions from cholera among the troops and jail populations in the Bengal Province for the series of twelve years from 1857 to 1868 inclusive, comprising a series of four triennial periods. The figures are taken from Bryden's Tables.

STATEMENT *showing Admissions from Cholera among the European and Native Troops and Jail Populations in the Bengal Province, together with the Average Strength of the Troops and Jails in the Province during each Year of the Series from 1857 to 1868 inclusive, and the Annual Rate of Admissions from Cholera per Mille of Total Strength of Troops and Jails combined.*

Years.	European Troops.		Native Troops.		Jail Populations.		Grand Total.		Rate of Admissions per 1000 of Strength.
	Average Strength.	Cholera Admissions.	Average Strength.	Cholera Admissions.	Average Strength.	Cholera Admissions.	Average Strength.	Cholera Admissions.	
1857	?	*156	?	?	15,930	*739	?	895	56·20
1858	5,985	320	?	?	17,218	711	23,203	1,031	44·40
1859	8,908	290	8,038	97	16,351	686	33,297	1,073	32·20
1860	7,102	329	7,767	137	15,111	1,393	29,980	1,859	62·00
1861	5,890	56	4,420	63	14,939	588	25,249	707	28·00
1862	4,803	38	4,603	41	15,354	367	24,760	446	13·57
1863	4,112	20	6,507	55	15,028	1,007	25,647	1,082	42·18
1864	4,308	20	7,907	89	15,344	615	27,559	724	26·27
1865	5,050	24	9,488	275	17,328	415	31,866	714	22·40
1866	4,381	28	9,188	93	19,111	1,415	32,680	1,536	47·00
1867	4,162	7	5,650	65	16,945	363	26,757	435	16·25
1868	3,624	17	5,476	36	16,278	289	29,377	342	13·47

* These numbers represent the cholera deaths of the year, the number of admissions being unknown.

NOTE.—The Presidency Hospitals and troops marching, the strengths of which are not known, are not included in the above statement. The death-rate for 1857 is calculated on the jail returns alone.

The above statement shows that during the four successive triennial cycles included in the twelve years 1857 to 1868 the cholera of Bengal, in its general incidence among the troops and jail populations of the province, has manifested a very remarkable regularity of rise, abatement, and fall in each triennial period. In the first year of each triennial cycle cholera has prevailed with epidemic activity, in the second it has somewhat abated, and

in the third it has subsided to the minimum prevalence of the three years' period. This remarkable regularity in the periodical recurrence of revived cholera activity in every third year is so uniform a feature in the prevalence of the disease, not only in this province, but in other parts of India also, as to preclude the idea of mere accidental coincidence.

It is a matter of interest and importance, also, to ascertain to what extent, if to any, this regularity in the periodical or cyclical rise and fall of cholera prevalence in the Bengal Province is connected with the annual rainfall. Most unfortunately no data are available up to this time to show the characteristics of these triennial periods in this respect. But that there is some real connection or relation between the rainfall and the prevalence of cholera in Bengal, as in the other provinces of India, there is no reason to doubt. On the contrary, general observation and popular opinion both strongly incline to a belief in the reality of a fixed and determinate relation between the rainfall and cholera activity. Owing, however, to the absence of statistical records, it is at present impossible to show what this relation is, or to fix and determine the causes which affect or influence the dependence of cholera upon rainfall for these years.

In Bengal, contrary to the experience of the other provinces of Northern India, it has been commonly observed that rainfall checks the activity of cholera. This is a point of very great importance in the elucidation of the nature and causes of the disease, and requires very careful consideration in order to understand why the season of rainfall in Bengal should check cholera activity; whilst it favours cholera activity in the North-Western Provinces, the Central Provinces, the Punjab, and even in certain portions of the Bengal Province itself. This is a subject I shall have to dwell upon in another part of this work; and we may, therefore, now pass on to the historical portion of our record without further comment in this place upon the very different effects of rainfall upon cholera prevalence, or the causes which produce that difference, beyond pointing to the very different physical conditions of the several regions alluded to, and the results of rainfall as affecting their several soils and the people dwelling upon them. These points it will be well to bear in mind when we come again, in a later passage, to discuss this subject.

In this year the office of Sanitary Commissioner for the Bengal Province was created. From the "First Annual Report of the Sanitary Commissioner for Bengal for 1868" the following particulars regarding the prevalence of cholera in the province during that year are gathered. The Bengal Province comprises Bengal Proper, Behar, Orissa, and Chota Nagpore.

Howrah District.—The civil surgeon writes—Cholera is endemic; it also occurs epidemically; diarrhœa very prevalent. On an average the subsoil water is found at a depth of about 12 feet from the surface. No wells are used in this district. Tanks are numerous. Cholera prevails more at the beginning of the hot and cold seasons than at other times.

Hooghli District.—The civil surgeon reports—In this district fever of a severe intermittent type is of an endemic nature; its attacks are confined mostly to the commencement and breaking-up of the rains, and also to the beginning of the winter months and to the periods of the reaping of the rice crops. Cholera shows itself at times in a severe form; frequently it is of a sporadic nature, directly traceable to exposure to damp and bad food. Sometimes the Damudah inundates the country and greatly enriches the soil, but as a rule the inundations are disastrous; both man and beast, and even entire villages, are apt to be swept away in a few hours. Water is found in

the dry season between 18 and 20 feet, and in the rainy weather between 7 and 8 feet, below the surface. Wells are not used. Tanks are numerous.

Jessore District.—Cholera is believed to have prevailed more largely in the district subsequently to 1867 than previous to that year. In 1867 a most virulent visitation of cholera occurred, and ever since then the district has been the seat of violent outbreaks of the disease. Jessore also participated, along with other districts adjoining, in the outbreaks of the so-called epidemic fever which prevailed from 1860 to 1865. During the latter months of 1867 and earlier months of 1868 cholera was extensively prevalent in this district. "It prevailed very generally all over the district, breaking out here and there without any apparent rule. Several thousand deaths occurred from this cause throughout the district. The disease appeared soon after the cyclone, and while the waters of an unusually high inundation were rapidly subsiding." The months of November, December, January, and February were characterised by an almost complete absence of rain. In March and April, however, rain fell in frequent copious showers, and cholera abated and subsided in the course of these months. "The type of this cholera was not very severe, as the station was not visited with any degree of severity, and the jail not at all."

The district of Jessore is a part of the delta of the Ganges. The depth of the subsoil water from the surface varies with the time of year, but generally water can always be found within a few feet of the surface. Wells are generally made of a series of earthenware cylinders, fitted into each other, and are from 20 to 30 feet deep. The depth of the tanks averages about 15 feet. Cholera is an annual visitant of the Jessore district. It is apt to prevail in the months of March, April, and May, and in October and November. The visitations of the later months are not so general and the type of cases not so severe as in the earlier months. When cholera appears in the district it breaks out simultaneously in different places, and no line of progress can be traced; generally its conduct is most eccentric; it will attack a portion of a village, a side of a bazar, a few inmates of a house, and no rule or law can be discovered in its origin or progress. "Heavy falls of rain check it, but if the rain is not sustained it is apt to appear again with renewed vigour. Hot, dry weather, with strong dusty winds, is the most favourable condition of its origin." Diarrhœa precedes and accompanies cholera. There is also more or less diarrhœa always accompanying the annual outbreak of fever in October and November. Dysentery is very prevalent in Jessore. The months of August and September appear to be the worst. (From Dr. Kenneth M'Leod's Report.)

Nuddea District.—Intermittent fevers are common all the year round, and cholera usually breaks out sporadically about the months of March and April. The subsoil water is found during the dry season at about 25 or 30 feet below the surface. Tanks are numerous. Well water is not considered good, and the people avoid it.

Berhampore District.—Cholera generally visits Berhampore in October or November, when the sandbanks in the river begin to dry up, and again in the months of March, April, and May. During the dry season 4 to 6 feet from the surface may be taken as the average depth of the subsoil water at some distance from the river Bhagirati, but during the rains the water in wells is almost on a level with the ground.

Furridpore District.—The climate of Furridpore, like that of Eastern Bengal, is excessively damp, but tolerably equable. By the end of June the greater part of the district is under water. In the autumn months paludal fevers of a bilious character more or less prevail. The heat is never excessive, and it is by no means uncommon for a hot season to pass without the thermometer ranging above 86° or 87° in the shade, the air being cooled by southerly breezes. Sporadic cases of cholera are usually to be met with more

or less in all parts of the district during this period. The depth of the sub-soil water from the surface varies from about 16 feet in winter to from 3 to 5 feet in summer. "In the dry season graves may be 8 or 9 feet deep, but in the wet weather they may be only 4 feet. Burials take place generally in the same compound where the deceased lived."

Backergunge District.—Cholera is endemic in the district, and is heard of and seen at all seasons except during the rains. Cholera usually makes its appearance at the commencement of the cold weather, and also at the end of that season, at which times it has a tendency to become epidemic. About the months of March and April cholera generally makes its appearance in the Barisal bazar. About this time the river is very low, and the water in the tanks has become very impure from the long drought and the filthy habits of the people. It generally lasts up to the commencement of the rains. During the months of September and October fevers are very common. The climate of Barisal is very damp at all seasons of the year. The cold weather sets in about the middle of November, and lasts up till the middle of February. It can never be said to be actually cold, and the bracing feeling experienced in Behar and the Upper Provinces is never observable. The night air is chilly and raw, and the mornings generally very foggy. During the middle of the day the sun's rays are very powerful. The cold season is thought very unhealthy by the natives, and numerous cases of sporadic cholera and fever make their appearance at this time of the year. The hot weather sets in about the end of February, and terminates about the middle of June, when the rains commence. During the hot season frequent storms occur, which clear the atmosphere, and render it very pleasant and cool for a few days. The heat at Barisal is never very oppressive, and the sea-breeze, which generally sets in about sunset, is very refreshing and conducive to health. The rains in this district are very copious. The whole country seems like a vast swamp, and the growth of vegetation proceeds with wonderful rapidity. The rainy season terminates generally about the middle of September, when the sea-breeze lulls, and the air becomes loaded with moisture and intolerably muggy. From this time to the setting in of the cold weather fevers are prevalent among the natives.

"Cholera is not usually heard of during the rainy season, and that is the only disease directly influenced by any particular season to a marked extent. All the other diseases prevail to a greater or less extent quite irrespective of the season of the year." The sub-soil water is found at an average of 4 feet from the surface. The water-supply for the inhabitants is principally derived from tanks, of which nearly every ryot has one on his holding. Diarrhœa is a very common affection. It is usually accompanied by severe dyspepsia, with flatulent distension of the bowels and stomach, causing considerable pain and distress. "The people believe that this disease is caused by bad water, and certainly the water procurable in the Barisal tanks is bad enough to cause any disease of the description; but the popular belief admits of doubt, inasmuch as the prisoners also suffer much from the disease, and they are never allowed to use any water that is not quite pure and carefully filtered."

Dacca District.—It is stated in the civil surgeon's report that "the following peculiarities regarding cholera are deducible from the records of the various hospitals:—1. Since cholera first appeared in an epidemic form in Dacca in August 1817, the disease has not failed to appear in the city during each year up to 1868. 2. April, November, December, and March are, in the order named, the most sickly months in the year. In Calcutta cholera is most prevalent in April, March, May, February, and then November. 3. Among the lunatics in the asylum the sickly months are November, December, October, and January; and of the deaths 20 per cent.

take place in those months. 4. Among the European residents 26 deaths have been registered during the last thirteen years; of these, 7 died in November, 6 in April, 4 in March, 3 in October, and 2 respectively in the months of June, August, and December. 5. Late rains and a slow subsidence of the inundations postpone the outburst of cholera; an early cessation of the rains is followed by an early outbreak of cholera. In 1867 heavy rain fell in the middle of November; cholera did not break out till the end of December. In 1868 the rains ceased by the 10th October; cholera appeared in various parts of the district and in Dacca about the 26th October. 6. Cholera is most prevalent at those seasons when there is the greatest range of temperature, as in April and November, and there appears to be a close connection between the attacks and exposure to chills, especially at night." (From the Report of Dr. J. Wise, civil surgeon, Dacca.) He also states—

"There is one peculiarity about the endemic cholera of Dacca, that only on rare occasions does it spread among the members of a household. During 1868 those exceptional cases were more frequent than usual. In the village of Goran, on the 1st February, I saw six members of one family in the collapse of cholera at the same time; in another house three. Early in August four people were attacked in one house in Dacca; in a second instance, in another part of the town, four were also attacked, and two died. . . . The cholera peculiar to Dacca is not spread by contagion. One schoolboy, living with twenty others in a room which ought to contain only ten, is attacked with cholera; no disinfectants are used, and no measures of cleanliness are enforced, yet the disease never spreads to any of the other inmates. It is the general impression among the natives that it is not communicable from man to man. Regarding the disposal of the dead Dr. Wise writes—'In Dacca, within municipal boundaries, there are fifty-six recognised Mahommedan burial-grounds. The majority are in the outskirts of the town, and in the jungly tract bounding the north and north-western suburbs; others, however, are situated in the centre of densely inhabited places. . . . Throughout the district generally the dead are buried in the first piece of waste ground in the neighbourhood of the village. The Hindu dead are burnt on the banks of some stream or watercourse. When the deceased is a beggar and has no friends, the mouth is touched with fire, two *ghurras*, filled with earth, are fastened, one round the neck, the other round the loins, and the body is thrown into the river. A bamboo pole is driven through the belly into the bed of the river, so as to prevent its floating away. Where the river has lofty banks, . . . the public *ghâts* are selected as the fittest resting-place for corpses. The living, however, have no scruples in drawing water from the vicinity."

Mymensingh District.—Cholera may be considered endemic in this district. Sporadic cases are of frequent occurrence. Occasionally the disease assumes the form of an epidemic. For some years the disease has assumed an epidemic form more or less severe during the months of April and May. During the year 1868 cholera twice assumed an epidemic form—during the months of April and May, and during the months of October, November, and December. During both epidemics the disease was almost entirely confined to the poorer classes of the community. Sex appeared to exercise no influence. Children were less frequently attacked than adults. Epidemics in this district have generally lasted about two months.

Tipperah District.—The whole district is under water during the months from June to October inclusive. "Cholera, smallpox, and fevers prevail during the cold and hot seasons, the monsoons being the healthiest time of the year." The whole district is eminently malarious. Drinking-water is obtained from tanks chiefly. The people drink water indiscriminately from tanks, rivers, and marshes. No wells are ever used. "Cholera is endemic in the station and district, and sometimes assumes an epidemic form. In this station an epidemic of cholera occurs every third year, according to the statements of the oldest inhabitants." The civil surgeon adds—"My ex-

perience confirms the above, an epidemic having occurred in 1863 and 1866."

Noakholli District.—Subsoil water is found at a depth of 8 or 9 feet. No wells are used. Tanks are numerous and filthy. Cholera prevails more or less every year.

Chittagong District.—Dr. J. G. Grant, the civil surgeon, writes—"I believe cholera, like fever, to be endemic here—due to natural conditions of soil and climate—intensified by neglected sanitation and favoured by poverty. The poor, especially those of marshy parts, suffer earliest and most severely, without reference to caste." The epidemic of 1868 commenced in November 1867, and ended in May following; 2778 cases, with 1799 deaths, were reported by the police.

Pubna District.—A great part of the district is under water in the months of July, August, and September, to the extent of several feet. Wells are not used for irrigation, but many *kutcha* ones exist in the town and district, with good water at a depth of 12 to 15 feet in the dry weather, and 6 to 8, or less, in the rains. Tanks are not so numerous as in some other districts.

Rajshahye District.—Cholera prevails annually, usually from March to May, during which period, also, a good deal of diarrhœa is met with. The whole district is very dirty, jungly, and malarious, and subject to inundations.

Maldah District.—Cholera, malarious fevers, and dysentery prevail after the rains, when the waters begin to dry up.

"Generally the poorer classes of the people, and those who neglect the laws of health, suffer mostly from diseases, such as those who live in low damp houses, eat the most unwholesome food, drink unclean waters, and by their avocations are exposed to sudden changes of temperature."

The subsoil water is found at an average depth of 20 feet. In inundations of the Ganges the whole district of Maldah remains under water. During the inundation of the last year the country was for four months, from July to October, under water. Nearly half the land in the district lies waste, and covered with jungle or water. The climate of Maldah is not like that of other places in Lower Bengal. Situated on the extreme limit of the north tropic, the heat of summer and the cold of winter are both comparatively great; for, farthest from the Bay of Bengal, it does not possess the advantage of a cooling sea-breeze to counteract the effect of the excessive heat of the summer; on the other hand, the piercing cold wind from the north-westerly direction, without any counteracting hot breeze from the direction of the equator, makes its winter much more severe than in the districts of Lower Bengal. The average depth of the water in wells is about 24 feet during the hot season, and 15 feet during autumn and winter. During the rains the water-level is 5 or 6 feet below the surface, and often within hand's reach. The wells, as regards construction, are temporary (kutcha); consequently in two or three years they generally fill up by earth falling in from around during the rains, and, becoming dry, require to be dug up again in the hot weather. Tanks are not numerous, but the few that are seen are very large, and said to have been dug by the Hindu Governors of Gour (the ancient name of the district). They are mostly found in or about the ruins of that ancient city. Regarding the general mode of life, the civil surgeon writes—

"The habit among up-country people of taking one heavy meal a day, and starving for the remaining hours, is, I think, pernicious to their health. The custom among the Hindus generally of fasting on festival days, and eating raw grain soaked in water,

and green fruits afterwards, is also a fruitful source of bowel complaints, especially diarrhœa and dysentery, and under epidemic influences it becomes a predisposing cause of cholera. Pilgrims at *melas* and travellers on the way generally eat parched rice soaked in water, or curded milk and treacle, with which a large quantity of particles of dust floating in the air are usually mixed."

Regarding the epidemic cholera of 1868, it is stated that the epidemic cholera which broke out in Maldah in October 1867 did not entirely cease until the following June. The inundations of the Ganges during the rains of 1867 laid the whole district of Maldah under water from July to September of that year. The water commenced to dry up in October, when both cholera and fever broke out simultaneously in different parts of the district.

"More males than females—more of the labouring classes working in the fields, eating worse kinds of food than persons in affluent circumstances, and working within doors, eating good and easily digestible food—more of lower than of higher castes or professions, and more adults than children, suffer from cholera."

The extent of sickness was great, as very few villages escaped from its ravages. Mortality was also very great, though no statistical record is available on this head.

"When cholera visits a station where it did not appear at least for some years before, it does not leave the place without visiting it successively at least for three years, and then again disappears for some years. The disease is very rare during the rains, when the country is under water, and it is remarkable that it invariably breaks out when the waters begin to subside."

Rungpore District.—The subsoil moisture is found at a depth, on an average, of 10 feet. Tanks are very numerous. Wells, as a rule, are surrounded by bamboo fences. The inhabitants of Rungpore drink water, and use the same for culinary purposes from any and every source—from rivers, tanks, wells, swamps, and marshes, and even from any little hole containing a few bucketsful of collected rain-water, the drainage of the country. The climate of Rungpore is cooler than most places in Lower Bengal. From November to June it is extremely healthy, from which time fever (the common disease of the district) begins, being most rife about the end of the rains and of October. The civil surgeon considers the district of Rungpore "exceedingly malarious." Regarding the disposal of the dead, he writes—

"The poorer class of Hindus seldom burn their dead, but throw the bodies into the nearest ditch or pool of water, often by the side of public highways or in the immediate outskirts of villages; while the Mahommedan population scratch shallow graves two or three feet deep, and bury their dead frequently at their very doorsteps in the midst of villages. There is no regular place set apart for burial purposes."

There was no epidemic sickness in the Rungpore district during the years 1867 and 1868. The civil surgeon writes—"I am given to understand that epidemics are almost unknown in the district of Rungpore."

Julpaiguri District.—This district only came into existence on the 1st January 1869. It is composed of the whole of the old Western Duars and the two subdivisions of Bykanthpur and Boda, which formerly belonged to the Rungpore district. The district forms part of the belt of the Terai; all the districts north and north-west of Julpaiguri may be called Terai. The country approaching the mountains is very devoid of water during the dry season, and people in some places have to travel ten miles for water. The smaller rivers often pass for many miles underground, and then reappear, the beds which they traverse in the rains remaining to mark their course. Owing

to the hard stony nature of the subsoil wells are impracticable. In the plains distant from the hills the subsoil is entirely gravel or sand, or a mixture of the two, through which water percolates in all directions. True clay is not found in the district. The district is drained into the Ganges on one side, and the Brahmaputra on the other; the slope for natural drainage is well marked, "and the stagnation of water is impossible." Water is found in the dry months from 12 to 15 feet from the surface. In the rains it is almost level with the surface. The country is partially under water during the rains in July, August, and September; the surplus water is, however, rapidly carried off when the rains cease, and the lodgment of water is a very rare circumstance. Tanks are not numerous. "The district is undoubtedly malarious, and some portions of it eminently and dangerously so." The water-supply is from wells, rivers, and tanks. The villages are generally situated on the highest spots of land obtainable. The dead are disposed of by burning on the banks of rivers, and by burial about 4 or 5 feet below the surface, at some distance from villages and human habitations, as the case may be. Regarding cholera, the civil surgeon of Julpaiguri writes—

"Cholera is raging to the east and west and south at this moment (14th May), in a very severe form; but it is not a frequent visitor of this district. It seems to have marched north from Rungpore, Kuch Behar, and Purneah." Writing of the general mode of life of the people, he mentions "fatigue and frequent wetting during the cultivating seasons, and sleeping on damp floors," as productive of rheumatism; and in regard to the frequency of dyspepsia, says—"Food is eaten in too large a quantity at a time, and at too long intervals."

He also states that "prostitution is very rife, and enthetic diseases, affecting both sexes and all ages, are exceedingly frequent."

Darjiling District.—This district has only in recent years been reclaimed from dense jungle and populated; it contains the Hill Sanitarium of the Bengal Province and numerous tea plantations. The population is chiefly agricultural. In 1864 the district was visited by epidemic cholera, but to a limited extent only; it appeared simultaneously all over the district; the deaths apparently were few, and the duration of the epidemic short.

Purneah District.—The civil surgeon reports that no epidemic prevailed in 1868.

Burdwan District.—Cholera is endemic in the district. Outbreaks of the disease "are of occasional occurrence in Burdwan, but the character of the disease is generally mild. Every year during the hot season sporadic cases are reported." The water-supply is from the Banka River and tanks. Malarious fevers of a severe intermittent and remittent type were epidemic during 1867 and 1868, and caused much loss of life.

Bankura District.—The subsoil water is generally found about 15 or 20 feet below the surface. Tanks are very numerous; there are very few wells indeed. During the rains the subsoil moisture is found at a depth of 17 or 18 feet, and in the cold season of 10 feet. Cholera was very rife in some parts of the district in 1868, especially at Sonamukhi. The civil surgeon of Raniganj, in this district, states that "cholera is never absent in spring."

Beerbhum District.—Regarding cholera the civil surgeon writes—This disease has been flying about the district during the months of March, April, May, July, October, November, and December. Sudden violent outbreaks of a most virulent character have occurred during the months in question in different localities simultaneously, or at short intervals, carrying off in a few hours a large number of those attacked, and then suddenly disappearing

from one place to reappear in another; but in some localities it lingered for longer periods, and even visited the same place in some instances twice during the year. Regarding the meteorology of the year he writes—The only peculiarity calling for notice during the past year was an excessively cloudy, close, and sultry state of the weather, and a constant slight drizzling rain, daily, in the month of September; the almost total absence of heavy falls of rain and the high winds and thunderstorms usual at the setting in and breaking up of the rains, and the early cessation of the rains in September. The chief characteristic of the climate of Beerbhum is its extreme dryness, in which respect it resembles that of the upper provinces, but it is neither so hot nor so cold. During the hot season, however, and beginning of the cold, outbreaks of cholera frequently occur, and sporadic cases occur at other seasons.

Rajmahal District.—The subsoil water is found at an average depth of about 14 feet. The whole of the district is higher than the flood-level of the Ganges. Cholera and fever are the diseases that prevailed epidemically in certain localities during the year 1868. Cholera broke out about the middle of April, and continued to prevail in the district to the end of the year, a total of 335 deaths from the disease being reported.

Sonthal District.—The country is hilly and undulating. The water-supply is from ponds and reservoirs, formed by damming the drainage channels on the hill slopes for the retention of rainfall. This district is not so malarious as places in Lower Bengal.

Manbhum District.—The subsoil water-level is between 17 and 18 feet below the surface. Cholera is "almost always hovering about the district, cropping up now and again at different places." Tanks are numerous.

Singbhum District.—This district was visited by epidemic cholera in 1861 and 1866; in the latter year the disease appeared in March, and continued till October. There was no epidemic cholera in 1868.

Hazaribagh District.—The general altitude of the district is 1900 feet. The subsoil water is tapped at an average depth of 21 feet from the surface. Water for drinking purposes is drawn from wells principally; there are also numerous tanks. A few cases of cholera occurred in the town during part of April and May 1868. There are no statistics to show the prevalence of the disease in the district. The elevation of the station of Hazaribagh is about 2000 feet.

Bhagulpore District.—Cholera usually appears about March or April and in August. It has appeared in every month. This year, 1868, it only came in November and December, and in the town it was only slight. The subsoil water is reached at from 30 to 40 feet below the surface. The water-supply is from the Ganges River, wells, and tanks. "Cholera may be looked on fairly as an endemic disease in this town and district, as it comes every year, and at all seasons of the year, in varying proportions." In 1866 it appeared first in March, in 1867 in April, and in 1868 in November. There are no statistics to show the prevalence of the disease or the mortality caused by it. The police reported a total mortality from cholera in 1868 at only 336, which, the civil surgeon says, is an absurdly low estimate.

Monghyr District.—The subsoil water is found at a depth of about 20 feet below the surface. The year 1868 was an unusually healthy one in this district. Cholera prevails to some extent every year in this town and district. It generally makes its appearance about the end of March, is common during April, and disappears in May. In years of epidemic prevalence it continues later.

Gya District.—The subsoil water is usually found at about 20 feet below the surface, but the depth varies according to locality and season. There are no canals in the district. "Cholera is undoubtedly endemic in the town and neighbourhood of Gya." In 1866 the disease prevailed epidemically.

Patna District.—"Here, as elsewhere, we have cholera in the hot months and during muggy breaks in the rains." Cholera and intermittent fever are always endemic here, but neither have assumed any alarming proportions during the last four years.

Tirhut District.—The water-supply is from streams, tanks, and wells. Malarious fevers are said to be endemic, but no mention is made of cholera.

Chumparun District.—The subsoil water-level during the dry season may average from 15 to 20 feet from the surface, and from 10 to 15 feet during the rainy season. Wells are numerous, and usually lined with tiles; tanks are not numerous. Cholera is one of the prevailing diseases of the district, and also intermittent fever.

Midnapore District.—The subsoil water-level is from 40 to 60 feet below the surface. Cholera prevailed epidemically throughout the year in the district. The following statement shows the prevalence of the disease monthly, as reported by the police:—

STATEMENT *showing the Number of Attacks and Deaths from Cholera during the Year* 1868 *in the Midnapore District.*

Cholera.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Attacks .	7	110	375	619	90	71	33	23	19	114	105	39	1,605
Deaths .	7	91	277	461	77	59	29	23	19	112	88	33	1,273

Cholera visited the district epidemically in nearly every year since 1860 inclusive; in 1860 in March and June, 1861 in March, 1863 in September and October, 1864 in February and March, 1866 in February and June, and 1868 in March and April.

Balasore District.—The water-supply is from rivers, tanks, and wells. "The worst cholera epidemic that has occurred in Balasore for some years was in 1866." The disease is endemic in the district.

Cuttack District.—The depth of water from the surface varies from 8 to 18 feet, according to season of the year; but in many of the villages skirting the hills, when the wells are sunk in a substratum of laterite, the water may be found within from 1 to 2 feet of the surface, according to the time of year. Tanks are not numerous, except along the base of the hills, where there may generally be about four to the square mile. Cholera prevails usually from May to August.

Poori District.—Wells are seldom dry, and are numerous; water is generally to be had at from 10 to 20 feet. Drinking-water is derived from tanks and wells. Cholera is a constant visitor, and frequently breaks out among the pilgrim assemblages at the several religious fairs held in this district.

1869.—In this year, the first of a new triennial cycle, cholera again prevailed with a revived epidemic activity, although its intensity was greatly less than in the corresponding year of either of the two preceding triennial cycles. (See Table No. V.)

The rainfall of 1869 was about 2½ inches less than that measured in 1868, and 1¼ inches less than the average fall for the province. The deficiency occurred in the falls of the second and third quarters. There was also a marked rise in the price of food in 1869; the average price of rice rose to 20.51 sers per rupee from 23.36 sers in 1868.

Regarding the meteorology of the year, it is recorded by Mr. H. Blanford, Meteorological Reporter to the Government of India, that—

"The most striking feature in the temperature of 1869, as compared with that of 1868, is its high range in the first five months of the year." The greatest excess of temperature then occurred at Berhampur, and at this station it was at its maximum in May, or immediately preceding the commencement of the rains. But Patna, Hazaribagh, Benares, and Rurki also show excessive temperature in May, second only in this respect to Berhampur.

Regarding humidity, it is recorded that—

Except at Sagar Island, Calcutta, and False Point, the atmosphere in the earlier months of 1869 was generally drier than in the corresponding months of 1868. This was especially the case at Berhampur, Jessore, Darjiling, Patna, and Monghyr, out of thirteen stations recording, as well as apparently in the North-West Provinces; and it seems not improbable, Mr. Blanford observes, that it was at least in part due to the deficient rainfall of the preceding year. Hazaribagh seems in some degree to be an exception to the rule, since, while the temperature was considerably higher in the earlier months of 1869 than in those of 1868, the humidity of March and April was also higher. But even here the chief excess of temperature was in February and May, and in both years the dryness and temperature were comparatively great, and the barometer low. The absolute distribution of humidity during 1869, in like manner, was in general inversely as the temperature.

Regarding rainfall, it is stated that—

The rainfall in 1869 was less than the average in Orissa, the Gangetic delta, and Arracan; also in Eastern Bengal (except Sylhet, and *probably* Cherrapunji), in Lower Assam, Sikhim, and parts of Behar. It was above the average at Suri and Berhampur, and over a tract of country stretching between the Rajmahal Hills and the Bhutan Duars, including Dinagepore, Rungpore, and probably Julpaiguri and Baxa.

The following particulars regarding the prevalence of cholera in the several districts are gathered from the Report of the Sanitary Commissioner for Bengal for 1869-70:—

Jessore.—Cholera prevailed in December 1868, and raged till the middle of January 1869; in Jessore bazar and neighbourhood 139 cases, with 84 deaths, were reported; all these cases occurred in the native quarters, none amongst the European community. "Outbreaks usually occur after a long absence of rain. The disease prevails sporadically throughout the district during the greater part of every year." In April 1869 cholera was raging in various parts of the district, and extra medical aid was asked for.

Nuddea.—In October 1868 a few cases of cholera occurred at Santipur during a fair that was being held. It then disappeared entirely until the end of November, when it broke out again, and simultaneously it appears to have become generally prevalent all over the district. The disease continued to prevail pretty generally until April 1869, when it disappeared altogether. From 8 circles a total of 878 cases, with 305 deaths, is given.

Murshidabad.—In 1869 cholera appeared at Jangipur on 11th March, and in the course of April spread rapidly in the district. At the same time cholera was raging in the neighbouring districts of Rajshahye and Pubna.

Furridpore.—No epidemic during the year.

Backergunge.—No information furnished regarding cholera in the district during 1869; but 32 cases, with 19 deaths, from the disease occurred during the year in the jail.

Dacca.—Cholera prevalent in the town in February; by the month of June the disease had very nearly subsided, though cases were seen now and then in every month. On the 29th October the disease again broke out, and continued very prevalent in the city during November. After November it abated; but still persisted at the end of the year, though in a much diminished degree. During the latter part of the year cholera prevailed in several parts of the district, but no reliable information of the mortality caused by it is available. At the Baroni Fair, held at Munshiganj in 1869, 13 miles from Dacca, 8 cases of cholera, with 5 deaths, occurred; the first case was on 22d November, the last on 16th December. Cholera was prevailing at Dacca before the fair commenced.

Mymensingh.—No report received.

Tipperah.—Commencing in the early part of December 1868, cholera prevailed to a great extent in the early part of 1869; the disease lasted until May, and out of 3830 attacked 2562 died. The first cases appeared in the northern parts of the district; the disease spread rapidly over the district, following no regular course, appearing suddenly in one place and disappearing as suddenly, after carrying off a few victims, then reappearing in another; it was noticed that places in the neighbourhood of rivers and *khâls* suffered more than others. Cholera is endemic in this district, cases occurring every month throughout the year; but it prevails mostly in the cold and dry months, as is shown in the following statement, compiled from police reports during the year:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Cases	1,474	435	246	380	249	12	0	6	1	0	34	183	3,020
Deaths.	978	387	129	278	169	11	0	4	1	0	21	119	2,097

Noakholli.—There was, the civil surgeon reports, no epidemic cholera in this district during 1869.

Chittagong.—Cholera prevailed in Cox's bazar from 6th April to 24th May; the disease was also prevalent at Teknaf, Chakaria, and Kutubdi islands, but no details of mortality are given for these places. In the Kushtea subdivision 441 deaths from cholera in 1869 were reported by the police.

Pubna.—Cholera appeared in January, suddenly increased about the middle of February, and attained alarming mortality for about a week after the 8th March, when, a slight fall of rain occurring, the number of deaths decreased for a few days; but again, on the 18th March, they became very numerous, and continued so until the 26th March, when they began to decrease. During the forty-eight days from 17th February to 6th April 181 persons died of cholera in the district; from 6th April to the 16th April 21 deaths occurred in the Pubna municipality. Cholera did not break out, as is usual, in the months of September and October.

Rajshahye.—Cholera was prevalent in the district; in the Naltur subdivision, from the 1st January to the end of May, 71 deaths were reported, of which 17 occurred in May and 18 during the last ten days of April.

Maldah.—Cholera prevailed in April, and again in December.

Rungpore.—Cholera prevailed during the spring months.

Dinagepore.—Cholera, in a sporadic form, was hanging about the district in the beginning of April.

Julpaiguri.—Cholera of a very virulent type prevailed extensively, "many families being completely swept away; villages became depopulated. The epidemic ceased on the occurrence of frequent thunderstorms, accompanied by heavy falls of rain." Cholera "prevailed extensively in Rungpore and Kuch Behar in March 1869, and probably spread from thence into the Julpaiguri district."

Darjiling.—On the 7th May 1869 cholera appeared near Mattigara police station, in the Terai portion of the district, about 40 miles from Darjiling, and close to the high roads from the plains. On the 21st May two boys, sons of a coolie, were attacked on the Makhibari tea estate, 22 miles from Darjiling; elevation 3500 feet. They lived in a hut on the high roadside from the plains. No cholera was reported at that date in the country intervening between this place and Mattigara. The first case at Mattigara was said to be that of a man who had returned with the disease upon him from a place in the Julpaiguri district, 12 miles from Mattigara. There was no history of human importation in the Makhibari cases. The third point of outbreak was at Pankabari, 5 miles below Makhibari; elevation 1800 feet. The greater part of the traffic from the plains passes through Pankabari. One of the first attacked was a cart-driver from Purneah; this was on the 3d June. The fourth point of outbreak was on the Takvar tea estate, some 6 miles north-west of Darjiling; elevation 5000 feet. The first case occurred in the last week in July; here again no human importation could be traced. "There was at the time no cholera nearer Takvar than in the Terai, over 30 miles off." The fifth point of outbreak was in the station of Darjiling, on the 14th August. There had been no case for the previous ten days at Takvar, where the disease had died out; "and there was no cholera nearer Darjiling than the Terai, 26 miles distant." In the station of Darjiling the first person attacked was a tailor, an elderly man, who had been delicate for some time before. He lived with his family in a hut, in quite a sequestered part of the station, some hundred yards below the convent, where he worked. No other houses were near his. He rarely went to the bazar, and had had no communication with Takvar tea estate or the Terai. No main road passed near his house. The family included seven or eight individuals of different ages. He died in a few hours. Two more sickened of cholera on the 17th, of whom one died rapidly and the other was removed by the survivors, who suddenly abandoned the house and fled, no one could say where. They returned on the 23d. The child taken away sick had died; another was brought back ill; and two more were seized after their return. The site of their house is on a steep slope, unfavourable, by the necessary absence of subsoil moisture, to the development of cholera from germs, on the Pettenkoffer theory. The second case attacked in the station was also a tailor, but, like the first, one who worked exclusively at a European house. He lived in one of a collection of some dozen huts close to the high road, about a mile from the Darjiling bazar. These huts were all crowded with Nepalese. He was attacked on the 15th August, and died on the 17th. Not another case occurred in this collection of huts; but a report reached the man's employer a little later that the tailor's wife and children, who had gone after his death some miles into the interior, died of cholera. The tailor had worked for weeks at his employer's house, and, as in the first case, the civil surgeon could never discover how cholera reached him. On the 17th three cases of cholera occurred in the bazar. On the 18th two cases of cholera, besides these, were brought

into the special hospital then organised. A day or two later a dhangar (drover) died in a few hours of the disease in the bazar; then the disease disappeared. The seizures occurred over about eight days. More than half of those attacked died. The civil surgeon observed no particular change in the weather when cholera ceased. He saw the majority of the cases in the station, but noted no difference in respect of symptoms and course from cholera elsewhere. If the police reports, he observes, are to be believed, cholera hung about the station for several months in the height of the rains in 1864. There was no information as to the ravages of the disease in the Terai. It appears to have broken out and died away again several times between May and September without moving in any epidemic wave (from the Report by Dr. T. Matthew). The disease did not enter the Darjiling jail, nor did it attack any Europeans at the Sanitarium. At Mattigara, from 7th May to 14th August, 103 cases occurred, with 89 deaths; at Nakesarbari, from 26th May to 14th August, 39 cases, with 31 deaths; at Kurseong, from 28th May to the first week of August, 104 cases, with 69 deaths; at Phansidewa, from 2d July to 9th August, 28 cases, with 23 deaths.

In the Kuch Behar division cholera was raging in the villages of the Singimari district, on the east bank of the Brahmaputra River, during January and February 1869, and at Serajganj also about the same time. In Singimari district 93 deaths were reported up to the beginning of February. The disease appeared first among the Muhamadans residing on the sand-banks adjacent to the Brahmaputra at the time of the Ramazan fast; and "it was observed that villages where there were large trees suffered less than where there were none."

Purneah.—It is stated that cholera generally appears in Purneah every alternate year, between March and May. It has not been so severe as in this year since 1863. The first case in 1869 occurred in the eastern part of the district on the 5th February, about the breaking up of the Caragola Fair, which is generally about the time that the disease is looked for. The disease was general over the district. The following deaths were registered :—

	February.	March.	April.	May.	June.	Total.
Deaths . .	10	84	1512	239	7	1,852

The number of recorded attacks was 3038, but the civil surgeon believes that at least 10,000 must have been attacked. In the town of Purneah the first case occurred on the 12th February; 14 deaths were recorded from that date to 8th June. In the jail only a single case occurred, on the 17th April, although 400 persons are reported to have died in the neighbourhood. Among the police, 757 strong, there were 3 cases, all fatal, and all in February.

Burdwan.—Nothing is said of cholera in the report from this district.

Bankura.—Cholera appeared in the beginning of the year at Sonamukhi, after the epidemic of fever, and lasted until February; 63 deaths occurred in seven days. The disease appeared in the town of Bankura in March; in December it was prevalent in Berhampur, where 17 died in three weeks.

Beerbhum.—Cholera prevailed in every month from January to August inclusive; 1173 attacks, with 838 deaths, were reported.

Sonthal.—On the 7th February, two days before the great day of the Shibrât festival at the temple of Byjnath, in Deogarh, a woman, a resident of the town, was attacked with cholera, and died after thirteen hours in hospital. On the 11th a pilgrim, who had been suffering from diarrhœa for four days

on the road, was brought to the hospital in a state of unconsciousness; he died after a few hours. From this time the disease continued to prevail in the town till the 21st or 22d, when it abated. About the middle of March fresh cases again occurred, and in a few days the disease prevailed virulently in the filthiest parts of the town. At the end of April the disease spread to the villages around, and became general, and also attacked the coolies working on the railway. About the middle of May it gradually subsided, but in September reappeared again in different parts of the district. "The disease prevailed most severely when the weather was cloudy and drizzly." In Deogarh there were 251 cases treated, with 74 deaths. The number of deaths in the district is unknown.

Manbhum.—Cholera was prevalent generally throughout the district during every month from January to October 1869. At Purulia the first case occurred on the 3d February, the last on the 22d June. There was a sharp outbreak in a village about a mile distant between the 13th and 22d February, there being 27 attacks, with 19 deaths. At Purulia 27 deaths occurred in the town, and 1 among the police, 148 strong, on 23d June. The following cholera deaths in the district, from 21 registering stations, were reported by the police:—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total.
Deaths .	4	18	51	31	73	38	64	8	24	10	321

Singbhum.—It is recorded that there was no epidemic cholera in 1869 in this district.

Hazaribagh.—The police reported a total of 1075 deaths from cholera throughout the district in 1869. "The large and filthy city of Echak, where cholera usually prevails with great fatality, this year *escaped altogether*. The large town of Chaltra, however, about 38 miles west of Hazaribagh, which was free from cholera last year, this year suffered rather severely." The first case of cholera in 1869 was reported on the 1st March, at the village of Bagdah, 50 miles south-west of Hazaribagh, on the borders of the Manbhum district. Cases were reported from the district till the 19th March, when a constable who had been on guard at the Central Jail was attacked. He was taken to the hospital, and died soon after admission. On the 22d a resident of the town of Hazaribagh, who had returned twelve days previously from Gya, was seized with the disease. On the 3d April cholera broke out at Baru, 52 miles east of Hazaribagh, and was said to have been introduced by a marriage procession from Khetu, a village in the same subdivision; but it was not determined that the disease was prevailing at Khetu. The man in whose house the marriage was celebrated was the first to die, and after him one of his relatives. The majority of those who died during the three days that the disease prevailed were of the weaver caste. From 20th April to 13th July there was a lull in the prevalence of the disease. It was then reported to be raging in different parts of the Pugarh subdivision. A few cases were reported in August; and on the 14th October two constables died at Hazaribagh, after which no other cases appeared. "It has been ascertained that the whole of the police guard drank water from a polluted source, the use of which had long been forbidden. But only two men were attacked. They had fasted for two days, and afterwards eaten freely, chiefly large quantities of sweetmeats." It is particularly to be observed, writes the civil surgeon, that nearly the whole of the northern part of the district escaped the disease, which did *not* seem to follow the main line of traffic.

Chota Nagpore.—In the whole tract of country from Palamow to the

Hazaribagh border, and from Ranchi to the Palamow border, and in Lohardagga, cholera was very prevalent from April to August, and many deaths were reported. In Palamow 2000 cases are supposed to have occurred between 19th April, when the epidemic commenced, and the 15th July. Of 378 cases treated 111 proved fatal. At Ranchi, where cholera had shown itself in the bazar every now and then since March, the disease reappeared on the 3d August.

Bhagulpore.—Cholera appeared first on the 3d February, in the persons of two constables who had returned from Purneah and Sahibganj. During February the disease appeared at Katanria on the 13th, at Kumarganj on the 22d, and at Kolgaon on the 26th, all in widely different directions, but to the south of the river. After this the disease appeared simultaneously in numerous places on the north of the river, and this part of the district was much more affected than the southern portion. By the middle of April the disease had reached its greatest intensity, and many places suffered very severely. All the circles on the main line of traffic north of the river were affected. The disease continued to rage till the end of May, when it gradually subsided, until its final disappearance in October. No part of the district escaped altogether; but the northern was affected much more severely than the southern portion, and the station of Bhagulpore itself was comparatively exempt. Here the land is comparatively high. The first case within the Bhagulpore municipality, the area of which is about 8 square miles, with a population of over 60,000, occurred on the 3d March 1869; there were reported 79 deaths and 246 cases. In the local dispensary 148 cases, with 21 deaths, were treated from January to September inclusive. Among the police, 274 strong, there were 3 cases, with 1 death. The following deaths were reported in the district during 1869:—

	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total.
Deaths .	4	101	826	304	42	49	21	5	6	1,358

The mortality reported is considered to be only half what really occurred. The number of attacks reported was 4050.

Monghyr.—Cholera in this year spread over the entire district, but in a very mild form. The disease first appeared on the 23d March, in the village of Balah, adjoining the Bhagulpore district, in the north-east, and at the same time in the extreme west, in the direction of Tirhut. In the south it appeared on the 9th April at Fattehpur, an isolated village in the hills. The first case in the town of Monghyr itself occurred on the 9th January 1869; the patient was a European railway passenger brought from Jamalpur. He recovered. The first *death* in the town of Monghyr was reported on 15th February, soon after some camp-followers of the Madras Native Infantry Regiment, sent from Jamalpur, had died in the Monghyr hospital. There was no epidemic of cholera in the civil station. Among the municipal police, 343 strong, 1 death from cholera occurred on the 24th April. "On the occurrence of a thunderstorm, which occurred on the 22d April, *three* patients in a state of collapse immediately revived in an unexpected manner. During the prevalence of the epidemic an east wind prevailed for months at a time when it is usual to have a westerly wind." The following is the return of cholera deaths reported in this district in 1869, but the figures are considered to be underrated:—

	March.	April.	May.	June.	July.	August.	September.	Total.
Deaths .	16	257	327	117	19	43	1	780

Gya.—No part of this district escaped cholera in 1869, but the western portion suffered most severely. The first case occurred on the 8th January, in a village on the opposite side of the river Falgun, close by the town of Gya. In the town of Gya, population 70,000, there were 213 deaths from cholera during the year. "It prevailed more severely in the town of Sahibganj than in the old town of Gya, although the first is wonderfully clean, whilst the old town is notoriously filthy." No Europeans or Eurasians in the civil station were attacked. The strength of the police in the station was 375, in the district 1031; only 2 deaths occurred from cholera, and these were both away from the lines. The following is the return of deaths reported during the year, but the civil surgeon "believes these figures much exaggerate the prevalence of the disease:"—

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Total.
Deaths.	33	16	56	159	318	805	1,145	1,301	264	40	40	4,177

Patna.—Cholera appeared in almost every part of the district, but was not very fatal. The first case appeared in Patna itself, on 25th January 1869. The first case in the civil station of Bankipur occurred on the 12th October; 4 deaths occurred from cholera, all Europeans, in the convent; among the police at Bankipur, 1700 strong, there were 26 attacks, with 6 deaths. The Mitapur jail was affected; there were 16 attacks, with 5 deaths; the first case occurred on the 27th March, and the last on the 17th April. The Inspector-General of Prisons writes—"There can be no doubt that the cholera in this instance began in the jail, and was not imported from without." The following are the cholera deaths reported in the district during the year:—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	Total.
Deaths .	176	131	168	100	228	176	293	443	0	1,710

Shahabad.—Cholera was rife throughout the district from April till September. Scarcely a village escaped. It prevailed most severely at Saseram, where the disease broke out on the 16th April, eight persons having died on the previous night; thirty deaths occurred on the 17th. The Commissioner of Patna reports "that during these two days the wind was easterly. On the 18th it was from the westward; cholera at once disappeared. On the 20th the wind was again easterly; cholera reappeared, and five persons died." In the native city of Arrah, population about 20,000, the first case occurred on the 19th April, the last on the 13th September; during that time 263 deaths occurred from cholera. No cases occurred in the civil station. Of 847 police, not one was attacked. The following is the return of deaths from cholera in the district during the year:—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	Total.
Deaths .	5	2	1	138	976	829	899	592	26	3,468

"It is believed these figures considerably underrate the prevalence of the disease."

Sarun.—No portion of this district altogether escaped cholera in 1869. The first case reported occurred in January, in the village of Karpubya, in the centre of the district. No case was reported in February. In March four cases occurred in villages not far distant from Karpubya; in April the disease broke out in the north-western portion of the district, 40 miles distant from Karpubya; during May it was general throughout the district. The first case in the town of Sarun was in May; no cases occurred in the

civil station. Cholera appeared in the town of Chaprah on the 17th July 1869, and on the following day in the district jail. The following is the return of cholera deaths in the district during the year, but the figures are believed to underrate the mortality :—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	Total.
Deaths .	1	0	4	51	286	378	949	1,374	332	3,375

Tirhut.—This district was visited by a very severe epidemic of cholera in 1869. The disease was most prevalent in the north-east and eastern portion of the district. The first case was reported on the 9th April, in a village about 50 miles due east of Mozufferpore, and about 20 from the eastern border of the district. On the 3d May the disease had spread as far west as Darbhanga, where it continued to rage for a month and a half; upwards of 1000 deaths were reported by the police. The first case at Mozufferpore occurred on the 9th May, but here the epidemic did not become very severe. The epidemic lasted until the end of September, and, according to police reports, carried off 10,442 persons. The civil surgeon believes that this number might be nearly doubled. "When the disease first began to spread in the district, a very dry west wind was blowing strongly for several weeks. The difference between the dry and wet bulb thermometer averaged from 18° to 20°, and the subsoil water was very deficient."

Chumparun.—Cholera is endemic here. The first case in 1869 occurred on the 15th April, in a village in the Sogaon circle. The disease advanced from the western to the eastern part of the district gradually and steadily, though not quickly. At Motihari the first case occurred in the person of a female beggar on the 24th June, the last on the 30th October; total deaths, 22. No Europeans or Eurasians were attacked. Cholera raged in this district from April till November during the driest and also during the wettest weather, but with varying severity. The number of cholera deaths reported is 4230, and of attacks 5816.

Midnapore.—No report furnished.

Balasore.—No report furnished; but cholera is stated to have been present in the town and district in April; thirty deaths were reported in the town from cholera during the month ending 20th April.

Cuttack.—Cholera was less prevalent than usual in this district in 1869. "Comparatively few cases occurred in the city, and only a few villages, situated near the roads along which pilgrims passed to and from Jagannath, suffered from the disease." From Chowdar, a village on the pilgrim route, about 6 miles from Cuttack, twenty-nine deaths from cholera were reported. "It is a very filthy place, abounding with sickening smells, and with streets so narrow that in passing along an umbrella cannot be held over the head."

Poori.—Cholera appeared in the early part of the year, and continued till August, after the rains had fully set in. In villages near Poori, where insanitary conditions abound, the reported mortality was great. The villages farthest removed from the sea and on the pilgrim routes suffered the most. The divisions of the district along the coast returned only 23 out of 1089 total deaths from the disease.

1870.—In this year cholera, instead of abating, as was due in the normal course, prevailed with epidemic severity nearly equal to that of the preceding year.

The rainfall of 1870 was somewhat more abundant than that of 1869; but it was very differently distributed in the several quarters, the falls in

the first and second being much less, and in the second and last much more, than in the corresponding periods of 1869. In the price of food a marked improvement took place, and rice fell to 23.06 sers the rupee against 20.51 sers in the year before. In the local distribution of the rainfall much variation was observed. It is recorded that in Howrah, Kishnagarh, Chittagong, and Berhampur the fall was much below the average. It was also below the average in Bankura, Bhagulpore, and Shahabad. In Deogarh, Tirhut, and many other stations it was much above the average. Regarding temperature, it is stated that in a tabulation of the greatest mean monthly variations of heat in each month at Furridpore, for the five years from 1866 to 1870, it is shown that, "as usual, the rainy months maintained the most equable temperature during the year; the cold months and the three immediately preceding the rains showed increased variations, and the two most varied months were February and March. As was to be expected, the prevalence of general sickness observed a direct ratio to the extent of the diurnal range in each month; in other words, more sickness prevailed when the temperature was the most varied, and less when it was the least so." It is recorded that at Rajshahye, "during October and November, when cholera was very prevalent in the jail, the meteorological conditions were as follows:—

"The temperature was greater by 6° than in 1869; the daily range varied from 1° to 5°, whilst in the corresponding period of 1869 it was uniformly 5°. The rainfall was 3.24 inches less than in the corresponding week of 1869. The barometric pressure was 0.15 lower than in the same period of 1869; the diurnal range was 0.02 against 0.04 in 1869. The prevailing wind was north-east, instead of south-east as in 1869. For the first twelve days in November, in the mornings, the thermometer ranged from 80° to 84°, the maximum varying from 84° to 86°, the minimum range for the same period in 1869 being 74° to 77°, and the maximum from 80° to 81°. On the morning of the 14th November, however, the temperature suddenly fell to 76°. The days were cloudy while the temperature continued high; the nights were dewy when the temperature fell very low. The atmospheric pressure for this period was lower by 0.14 than in the corresponding period of 1869, the direction of the wind being north-east, against south-west in 1869."

In Tirhut the rainfall of 1870 was more than double that of 1869; "the country, and especially the station, suffered from scarcity of water and drought during the second quarter of the year. The level of the subsoil water was observed to have sunk very low at the time the cholera broke out; wells and tanks became dry as the hot season advanced." At Cuttack "the rains were very irregular, and but for the canals the whole of the crops would have perished."

In 1870, for the first time, the mortuary registers of this province show the mortality registered from cholera among the civil population. The returns, however, are confessedly very imperfect and unreliable. The total number of cholera deaths registered in 1870 among the civil population of the Bengal Province is given at 21,691, or at the rate of 0.70 per mille of the population under registration.

The following particulars regarding the cholera of 1870 are gathered from the Sanitary Administration Report for Bengal for that year.

Howrah.—No epidemic cholera prevailed; nine deaths, all sporadic cases, are reported in December throughout the district. Food was abundant, and the price of rice was low. "Neither floods, cyclones, nor drought occurred during the year."

Serampur.—Cholera was prevalent in the district almost every month during the first half of the year, but not in epidemic form. March, April, and May were the most fatal months. In April the disease declined; but in

December it reappeared in Kishtonagar, where there was an outbreak in February.

Hooghli.—Sporadic cases of cholera were reported from several places during the year, which is described as "far more healthy than usual." At the Tribani Fair in March only two cases of cholera occurred out of a congregation of 16,000 persons.

Nuddea.—Cholera prevailed over a great part of the district for many months. It appeared first on the 7th February in the district, and spread rapidly; the total number of villages affected was 486; a very few cases occurred in the large towns of Kishnagarh, Santipur, and Ranaghat. The reported attacks were 4657, and deaths 2866—considered much below the reality.

Jessore.—Only 64 deaths from cholera are reported to have occurred in the last six months of the year, which is described as one "of unusual salubrity" in this district.

Murshidabad.—Cholera appeared first at Berhampur in March, and prevailed in that subdivision during seven months of the year. Deaths were reported from twenty-one registering circles in the district. "The disease is usually absent in the months from October to February inclusive."

Furridpore.—A severe form of epidemic cholera broke out in the district in the beginning of the year 1870; it reached its height in March and April, by which time it had spread pretty uniformly throughout all the registration circles. "It is remarkable that, while the district was more or less extensively invaded all over by cholera during four months, not a single case occurred in the jail during its continuance, although daily recruited by fresh admissions from all quarters, as usual, throughout the invasion."

Backergunge.—Epidemic cholera broke out in the villages in the island of Dakhan Shahbazpur in December 1869, and continued till June 1870. The number of deaths is estimated at 2000. Fever was also raging at the time. "The rest of the district was unusually healthy." Only a few cases of cholera occurred in Barisal itself.

Dacca.—There was no epidemic cholera. "It is worthy of record that this year the inundations were unusually high and unusually long continued."

Mymensingh.—There were a few isolated cases of sporadic cholera in different parts of the district, but no epidemic prevailed.

Tipperah.—Cholera prevailed epidemically with the greatest virulence from January to April. No particulars, however, are furnished.

Noakholli.—Cholera prevailed epidemically in the district in the early part of the year; 779 deaths were reported during the year from eight circles.

Chittagong.—Cholera prevailed epidemically almost throughout the whole year in the central and northern circles, particularly during the first half of the year; but few cases were reported from the circles in the south. In the town itself cholera raged from March till May in a milder form, but over a larger area than in 1869.

Pubna.—There were only a few cases of cholera in this district during 1870.

Rajshahye.—Cholera appeared in this district on the 26th February, and at Baulia on the 7th March, and continued to spread till July; 514 cases, with about 358 deaths, were reported; but these numbers were considered to be "short of the truth." On the 11th June an outbreak of cholera occurred at Ferozpara, 7 miles south-east of Natore, and continued till the 22d; 40 cases, with 22 deaths, occurred in a population of about 300. The outbreak was attributed "to the use of water that had percolated through ground in which human bodies had only recently been buried. The disease confined

itself to this locality, and did not attack any of the neighbouring villages lying within even half a mile." At Baulia itself cholera prevailed from March to November; 174 deaths were reported in a population of 42,000; but the number was considered to be understated. The jail was not affected till October, when eight cases, all fatal, occurred.

Bogra.—There was no epidemic cholera. The year 1870 was an unusually healthy one in this district.

Rungpore.—No information.

Maldah.—Cholera prevalent throughout the year, but not so severe as in 1869.

Darjiling.—The district was remarkably healthy during 1870; only one or two cases of cholera reported, in the Terai.

Burdwan.—There was not much cholera in 1870. The disease appeared in Burdwan itself in April, and lasted four weeks; total cases 52, with 29 deaths. There was an outbreak at Kulna in August, with about 20 deaths.

Bankura.—Cholera was prevalent throughout the year in this district; it prevailed in Bankura itself from 23d February to 14th October, during which period it caused 85 deaths.

Beerbhum.—Cholera prevailed to a limited extent in this district from March to July inclusive; there were 263 cases, with 140 deaths.

Sonthal.—Cholera appeared in the district in the beginning of February, a little before the great Shibrât festival, and gradually spread to Deogarh town on the 13th, where the first resident was attacked on the 15th. The weather at the time was cool and pleasant, the thermometer ranging from 53° to 58°, and the wind blowing strong from the west and north-west. The epidemic subsided in about three weeks; in the town of Deogarh 120 cases and 41 deaths were recorded. In the Rajmahal district cholera prevailed from March to September. There were about 200 cases at Rajmahal itself.

Hazaribagh.—Cholera appeared in the district in the first week of February, to the north and north-east of Hazaribagh, and gradually spread in all directions. At Hazaribagh itself the first case appeared on the 18th June, and the disease continued in the place till the 21st August; the total number of cases being 112, with 61 deaths.

Manbhum.—Cholera prevailed to a slight extent in the western portion of the district during the second quarter of the year; the number of cases and deaths is not given.

Singbhum.—At Chaibasa the first case occurred on the 11th June, and the last on the 1st July; there were 14 cases, with 10 deaths. "The only peculiarity observed during the outbreak was that mostly children of from 4 to 10 years of age were attacked."

Bhagulpore.—Cholera was epidemic in this district both in 1869 and 1870. In the latter year the disease appeared in the district on the 15th February, and at Bhagulpore and Banka on the 23d; in March cholera was widespread in the district, affecting the south much more than the north. In April it was at its height, declining in July. "Both in 1869 and 1870 cholera in this district was observed to subside on the setting in of the east winds; whilst the disease prevailed the wind was westerly."

Gya.—There were a few sporadic cases of cholera from time to time in the district, but more frequently in the months from May to August.

Shahabad.—It is stated that the rains were very heavy, and continued up to a late date, even so late as the end of October, and as a consequence an unusual amount of fever of a severe intermittent and remittent type prevailed during the succeeding two months over nearly the whole of the

district, but chiefly in the southern portions of it. The crops during the year were good, and the price of food below that of the previous year. A slight outbreak of cholera was reported at Jagdespur, in the south; "but it soon ceased, as the rains set in heavily and the weather became cooler."

Saran.—There was not much cholera in this district during 1870. In the fair held in this district there were 7 cases of cholera and only 1 death in an assembly of about 50,000 persons. There was one fatal case in the jail, and another among the police, 600 strong.

Tirhut.—Cholera was prevalent in this district about March, and reached its height in July, after which it began to decline. In July the mortality stood at 1229.

Chumparun.—No information.

Midnapore.—Cholera broke out on the 28th January 1870, near Midnapore bazar, where there were 19 cases, with 8 deaths, out of a population of 500. On the 17th March the disease assumed an epidemic form and became widespread, more particularly among the poor. The disease was at its height from 20th March to 20th April, declining in May. There were about 500 cases and half as many deaths. "Cholera is endemic at Midnapore."

Balasore.—There was a virulent form of cholera here during February and March, and the disease was prevalent in the district to the close of the year.

Cuttack.—"Cholera prevailed during June, July, and August, when it is known to occur every year throughout the district, especially along the pilgrim route." In October, November, and December it occurred in villages by the roadside, most of the cases being return travellers from Poori. During the last six months the deaths are reported to have been 485.

Poori.—Cholera raged in the town from the 12th February to 21st March; and there was a second outbreak on the 14th June, which spread to the whole town and its vicinity; in October and November there were a few sporadic cases. In the town there were 420 deaths, exclusive of 127 in the hospital. The pilgrims visiting the place suffered severely; in the jail there were 6 cases, with 3 deaths; among the police, 2 cases, both fatal.

1871.—In this year there was a very marked subsidence in the activity of cholera in this province. Among the civil population the total number of deaths from cholera, as registered, was 14,510 against 21,691 in the previous year, the death-rates being 0.70 against 0.25 respectively. The monthly mortality registered among the civil population is shown in Table No. II., and its distribution by districts in Table No. I.

The districts that suffered most severely were Rajshahye, Murshidabad, Maldah, and Bogra; and in all the months of greatest prevalence were October, November, and December.

"The rains were excessive and prolonged; the number of rainy days beyond the average. All these districts suffered from inundation; the disease was generally limited to the submerged tracts and their neighbourhood; and privation, improper food, and exposure to wet and cold are believed to have been greatly instrumental in causing the mortality."

In Murshidabad district a dam on the Bhagirati River 22 miles north of Berhampur, gave way during the month of August, and inundated a very considerable tract of country in the interior of the district, carrying away villages, roads, and bridges, and causing great distress and much sickness. "It was in these tracts that, as the water ran off and the land began to dry,

cholera appeared. Berhampur itself suffered little, but there were 5 cases and 4 deaths in the cantonment under circumstances worth recording."

"At the north-western corner of cantonments is a block of buildings consisting of three sets of quarters, parallel to the river, and each having a long strip of garden behind it. The gardens of the end houses are much built over, but not that of the centre house, which, however, was unoccupied and the garden uncared for; . . . and there was a good deal of jungle in it. . . . In the beginning of May a coachman living in one of the outhouses of the most northerly house was seized with cholera, but recovered. In June the gentleman who occupied that house was attacked with the same disease, and died. In October a syce living in the compound of the house at the other extremity of the block of three took cholera and died. In November a compounder living in a house at the bottom of the garden of house No. 1 died in three hours from the beginning of his attack. In all there were five cases in the cantonment during the year, and all occurred in the two occupied houses of this one block of three. The Sanitary Committee met, examined most carefully the condition of the compounds, drains, &c., and the state of the garden, but could find nothing to account for the disease."

During the year 1871 cholera was prevalent in all the other districts of the Bengal Province, but the disease was generally mild in type, amenable to treatment, and showed little tendency to spread. "Owing to the unusually heavy rainfall in Northern India, the flood-level of the Ganges and most of its tributaries has been higher than at any time during the last ten years, and in almost every district considerable areas have been inundated either from overflow or from the bursting of local bunds. The local rainfall has also been excessive, and contributed to keep the country moist for a longer period than usual. Over these flooded tracts, where villagers have been driven from their houses and left shelterless, and their crops and property destroyed, there has been necessarily much privation and exposure, and it is among such people and in such tracts, during the period of their drying, that local outbreaks of cholera have occurred. There are a few districts, however, in which the disease was most prevalent and fatal during the hot months, such as Rungpore, which suffered most in April and May; Tipperah and Dacca in March and April, Gya in June and July, and Shahabad in May and June. In Dacca, where cholera existed throughout March, the disease broke out among an assemblage of 400,000 pilgrims, chiefly females, who had come to bathe in the Brahmaputra at Nangalband; fortunately it spread but little among them, and there is no record of its introduction by them into other parts of the district. . . . In the Chittagong Sanitary Report, the civil surgeon, Dr. F. F. Allen, mentions an outbreak of cholera, on board a steamer, among 300 coolies destined for the Lushai expedition. In this case overcrowding, filthy habits, and caste prejudices (by causing to fast for long periods rather than cook on board) seem to have been predisposing causes."

The cholera of 1871, although so much milder and less frequent than that of the two preceding years, was more or less prevalent in every one of the 728 registering circles of the Bengal Province. The following particulars are gathered from the reports of civil surgeons:—

Monghyr.—There were occasional cases in the town and suburbs from the end of May to the close of the year; they were never numerous, nor did they occur in anything like epidemic sequence, intervals of a week or ten days often elapsing without a report. In the jail, on the 4th June, an elderly convict was seized with cholera; the prisoner had not been outside the jail for months, had no intercourse with people from outside, and was living under exactly the same conditions as to food, water, employment, &c., as the rest of the prison population. There was no other case in the jail,

and, as Dr. Matthew writes, "how the cholera found its way to him alone is a mystery." Dr. Matthew states that—

"In none of the outbreaks reported in the town or suburbs did the disease show any tendency to spread;" and adds—"This is the history of cholera in non-epidemic seasons, in places such as Monghyr, situated within the endemic limits of the disease; cases occur every year, but if under conditions opposed to its propagation, the seizures are few and the attack dies out; let the conditions, however (and I cannot venture to guess what they are), be favourable to the spread and growth of the poison, the disease assumes an epidemic character."

Purneah.—Cholera appeared in the south-east of the district in October, in localities where the Ganges had overflowed, and was limited to the area of inundation. Dr. Picachy attributes the outbreak to a damp condition of the soil and air, to the destitution, insufficient clothing, and exposure to wet and cold of those affected, together with their use of bad, and especially uncooked, vegetable food.

Patna.—Cholera appeared in the town in August, and also in its neighbourhood, and continued during the three succeeding months. Early in November several suspicious cases of diarrhœa, attended with vomiting, occurred in the jail. On the 9th and three following days fifteen cholera cases were admitted, of which four died; 200 prisoners were at once removed to Digah, where three hours after their arrival three of them were simultaneously attacked, and one man died. Dr. Simpson connects this outbreak with the damp state of the jail wards; the walls were damp to the height of 4 feet; "the flooring was in such a state that in walking over it an impression of the foot was left, and a walking-stick could be easily pushed in up to its middle. It was just as this state of things was at its height that cholera broke out. Curiously enough, when the floods were at their highest level, reaching in fact to the jail walls, the wards were quite dry. This excessive damp only made its appearance after the cessation of the rains in October, and at a time when the level of the subsoil water, as indicated by the wells, had considerably sunk. Hay, provided for the prisoners to sleep on, needed drying before it could be used a second time." Isolated cases of cholera were reported from the district throughout the year.

Gya.—Cholera appeared early in June in several places in the west, north-west, and north of the town, and raged epidemically till the middle of July. At Kumani, 45 miles north-west of Gya, the disease raged for a short period, carrying off 15 men, 10 women, and 5 children in the space of a few days. "It appeared to me," writes Dr. Russell, "a very singular circumstance why this village was singled out by the disease, pounced upon, as it were, while all the other villages in the immediate neighbourhood remained intact. The village in question was not in any degree more crowded than the other surrounding villages, and there were no cesspools, foul drainage, or the like to account for the predilection."

Shahabad.—Cholera was rife in Saseram subdivision during May and June. The majority of the few cases reported in the town of Arrah turned out on inspection to be ordinary bowel complaints, due to errors in diet. Dr. Thornton remarks that intestinal worms appeared in some instances to have been the exciting cause of attacks resembling cholera. In October and November, also, cholera was reported from Baxar and its neighbourhood; "but, both from inquiry and personal observation, Dr. Thornton was induced to believe that nearly all the cases were really due to diarrhœa, dysentery, and other bowel affections. This opinion is also shared by Dr. Wright of Buxar."

Rajshahye.—Cholera existed during the entire year, and in November assumed an epidemic form in the whole of the district east, north-east, partially north, and west of the Sadr station—Mandah, in the extreme north, alone enjoying singular immunity. "The district was extensively inundated, and Dr. Bensley considers that the privation and distress to which the villagers were thereby subjected, especially predisposed them to the disease."

Midnapore.—"There were only a few sporadic cases here and there." Dr. Matthew remarks that, "while pilgrims have long been considered one of the principal sources of the disease, although large numbers of them passed through the highlands of the district and the town, they failed to import the disease; and that, so far as he could learn, it would appear that the parts of the district through which pilgrims pass year after year have been hitherto least troubled by this scourge." He adds that "dysentery and fever—the result of bad food and water, exposure and fatigue—and not cholera, are the causes of the heavy mortality among pilgrims."

Orissa.—These districts enjoyed comparative immunity from cholera during 1871. In Cuttack there were few cases reported from the district, very few in the town, and none in the jail, which suffered severely in 1870. In Balasore there was comparative freedom from cholera, notwithstanding that a very large number of pilgrims passed through the district. In Poori "there was no epidemic this year—a most unusual circumstance, as the disease breaks out annually in June or July, when the pilgrims arrive; not a single case came under the civil surgeon's observation. Reports of suspected cases were received, but on inquiry they turned out to be cases of diarrhœa and dysentery." Dr. Stewart "attributes this immunity rather to the steady and free rainfall from February to October than to any of the sanitary arrangements made at the last Rathjatra."

Chota Nagpore.—In these districts also there was comparative immunity from cholera in 1871. (From Report by Dr. C. J. Jackson, Officiating Sanitary Commissioner for Bengal for 1871.)

The rainfall of 1871 (see Table No. V.) was exceptionally heavy, no less than 75.95 inches against 65.10 inches in the year before; but the whole of this excess fell in the second and third quarters of the year, the falls in the first and last quarters being comparatively greatly in defect. Food was abundant in 1871, and the price of rice cheaper than in any previous year back to 1863.

The following brief sketch of the chief meteorological characteristics of 1871 is from the Report for that year by Mr. H. Blanford, Meteorological Reporter to the Government of India:—

Pressure.—"Atmospheric pressure was above the average during January and February at all stations except Darjiling, and during March at all except Darjiling, Chittagong, and Monghyr. In April it remained lower at Hazaribagh, and to a less degree at Cuttack, Calcutta, Dacca, and Patna, but was relatively higher than the average at Darjiling, Chittagong, Monghyr, Jessore, and especially so at Berhampur. In May it was generally above the average, and most so at Berhampur and Monghyr. In June it continued higher at Berhampur, Monghyr, and Darjiling, but fell everywhere else, and was especially low at Cuttack and Dacca. During the south-western monsoon it was above the mean at Chittagong, Dacca, Jessore, Monghyr, Darjiling, and, except during the month of July, at Berhampur also. In October and November the pressure was everywhere below the mean, and in December also, except at Cuttack and Patna."

Temperature.—"In January 1871 the mean temperature of the delta

was a little below the average of the four years, the greatest depression being at Jessore. It was also below the same average at Cuttack. On the other hand, on both coasts of the bay and in Behar the temperature was somewhat higher than the average. In February the temperature was above the mean everywhere. The greatest excess was at Berhampur, and at this place Dacca, Hazaribagh, and Patna it exceeded two degrees. In March and April the temperature again fell gradually below the average; first in the delta and lower part of the Gangetic plain, and afterwards more generally, Patna, Hazaribagh, and the stations on the east side of the bay being the last to remain above the mean. In May, owing doubtless to the early commencement of the rains, the depression of temperature below the average was universal, amounting to between three and four degrees at Cuttack, Jessore, Hazaribagh, Berhampur, and Monghyr. All the stations enumerated, except Patna, and temporarily one or two other stations, continued to enjoy a temperature below the average up to the end of the rains. In October, however, the fall of temperature was less than usual, and November and December were warmer than usual at nearly all the stations enumerated, especially at Cuttack and Patna."

Humidity.—"The deviation of the humidity of each month of 1871 from the average at different stations appears to have been very irregular. The humidity was exceptionally high at Patna during the first five months of the year, equal to it in July and August, and below the average during the last four months. It was generally a little above the average in February, except at Dacca and stations on the coast-line. In March this was the case only in the delta and lower Gangetic plain. In April this excess increased, and in May and June was very general. During the rains the difference became less, and in October the humidity was generally at, or a little below, the average. In November and December the humidity was somewhat greater than usual at False Point, Sagar, and Calcutta; in November at Darjiling also; but at Patna decidedly below the mean in both months. On the whole, in 1871 the air was unusually moist."

Rainfall.—"The rainfall of 1871 was unusually heavy in Northern India. In Calcutta it was the greatest on record, exceeding even that of 1868; and in many parts of the country the floods on the low lands were of such extent and depth as to reach the railways and cause serious interruption to the traffic. In the districts of Eastern Bengal, in Lower Assam, and in the intervening plateau of the Khasi Hills, the rainfall was considerably below the average. Cherrapunji received less than three-fifths of its usual quantity. In Upper Assam the excess was very great, amounting to one-third more than the average fall. In Orissa, again, as far west as Sambalpur, the rainfall was somewhat below the average; while it was greatly in excess in the western part of the Gangetic delta, in Chota Nagpore, in Northern Behar, and Tirhut. It was exceedingly heavy at Chaprah, where it was more than double the average quantity, and at Sewan. January was a dry month throughout Bengal, and February scarcely less so. In March there were some heavy showers, especially in the Midnapore district; and in Lower Bengal the rainfall in the month was about twice or three times the average quantity. In April the rain was frequent and copious, and extended over the whole of Bengal and Behar. May was in all respects like an average June, except in the districts north of the delta and in Assam, where, with local exceptions, the fall was not heavier than usual. From this time up to the end of September the rain poured on steadily in somewhat greater quantity than usual, and in the latter month, just before the close of the

rains, an excessively heavy fall took place in Tirhut and the adjoining districts of Chaprah and Chumparun. The last three months of the year, as a whole, were drier than usual."

Wind.—"The winds of Bengal during the first three months of 1871 were such as are usual at the time of year, except that in the early part of January they were somewhat more northerly. In April the fall of atmospheric pressure in Behar and Western Bengal was accompanied by a great weakening of the land winds in that region, and by a veering of those of the delta towards S.S.E. and S.E. In May there was a decided excess of easterly elements, and in the latter half of the month the winds were such as characterise the south-west monsoon, but more easterly than usual, especially in Behar. During these months the velocity of the wind was much below the average, and this again is characteristic of the monsoon as contrasted with the hot weather. This excess of easterly winds continued during June, and it was not until July that the monsoon assumed its normal character. On the return of the winter monsoon in October and November, the land winds set in much as usual in Behar, but in Bengal were less steady, and up to the close of the year the west or north-west winds were weaker than the average."

On the whole, the year 1871 was characterised by early and excessive rainfall; a temperature lower during the hot months and rains, but somewhat above the average during November and December; a greater amount of humidity and of cloud; more easterly winds in April, May, and June, and generally throughout the year weaker winds than usual.

1872.—Cholera in this year prevailed with revived epidemic activity, as in the corresponding year of the three preceding triennial cycles 1863–65, 1866–68, 1869–71 (see Table No. V.), and, as the death-rates show, with progressively diminishing severity or intensity in each succeeding cycle of the series of four. Among the civil population, despite the very imperfect registration, the death-rate was 0.63 per mille against 0.25 respectively. The death-rate for the troops and jails is mainly contributed by the mortality among the jail populations, viz., 6.95; the rates for the native troops being 1.63, and the European troops 1.09. The jail death-rate may be taken as an approximate guide to the fatality of the disease among the civil populations, for the reasons mentioned in a previous passage. For the monthly mortality registered among the civil population see Table No. II., and for its distribution by districts, Table No. I. The particulars of the incidence of the disease among the troops and jails are shown in Tables No. III. and IV. In Table No. V. the whole of the statistics are exhibited in abstract form at one view. In 1872 the rainfall of the Bengal Province was greatly less than the exceptionally copious fall of 1871; it was also much less than the average fall for the province. The year 1871 was one of excessive rain and moisture, the year 1872 of deficient rain and comparatively severe drought. There was a marked rise in the price of food in 1872; the average price of rice rose to 22.83 sers the rupee from 25.81 sers in 1871. In other words, the revived epidemic cholera of 1872 was accompanied or was coincident with the conditions of drought and high prices for food.

Among the civil population a total of 37,536 cholera deaths was registered against a total of 14,510 in the preceding year. Regarding the seasonal prevalence of cholera in this province, Dr. C. J. Jackson, the Sanitary Commissioner, writes—

"There are two periods in the year when cholera is especially apt to prevail in Bengal, viz., in the hot summer months, and the cold damp months of October, November, and December. Within the endemic area cholera prevails nearly all the

year round; but its general period of increase and fatality is during the cold and moist months. There are some districts within this area where it is apt to prevail extensively both in summer and winter, and this is especially likely to be the case where there has been any very excessive development of the disease during the previous cold season. It lulls during transition months, increases in the hot season, diminishes in the rains, and breaks out as usual in the cold weather again; while in a third series of districts, viz., those which lie towards the north-west, or which are just on the boundary of the endemic tract, the summer season is that of augmentation."

The following particulars are gathered from the Sanitary Commissioner's summary of the civil surgeon's reports :—

Burdwan.—Cholera was endemic in the district throughout the year 1872; most virulent in December, and most mild in July; but in no place did it assume an epidemic form.

Bankura.—Sudden outbreaks of cholera, sporadic in character, but of a virulent type, occurred from time to time in various parts of the district, but chiefly in localities inhabited by the poorer classes, promoted by a total disregard to the laws of sanitation and the filthy, irregular, and intemperate habits of the people. In towns and villages through which pilgrims travelled the disease appeared more frequently, and the deaths were more numerous in those places in which they halted.

Beerbhum.—Cholera, endemic in character, prevailed in the villages, in localities which differ entirely as to physical conditions. Some of these villages are filthy, low, and situated near the bed of the river, which, owing to the silting at its mouth, is converted into a sluggish stream during the rains, and is at other periods of the year a shallow lake, or rather a swamp. Some are on the low alluvium, others on the laterite or older alluvium, and others, again, on the rock. The one attribute they have in common is that of excessive filthiness and disregard of the commonest sanitary rules.

24-Pergunnahs.—Cholera in a sporadic form lingered in this district throughout the year, exhibiting a tendency to become epidemic in Diamond Harbour, Baripur, Damdam, and Satkhira. At the close of 1871, on 26th and 27th December, six cases of cholera occurred in a European boarding-house in Russell Street, Chowringi; two of the cases terminated fatally, one in the house, and the other at Ghazipur, on the third day after the patient's departure from Calcutta. Under the orders of Government, a committee was appointed to inquire into and report on the causes of the outbreak. The main facts elicited in connection with the outbreak were these :—Although the town of Calcutta was comparatively free from cholera in December, the disease was present in some of the suburbs; and in Bhowanipur especially a good many cases occurred throughout the month, and a very distinctly marked house-epidemic took place in the house of a babu, in which 1 case occurred on the 22d December, 2 on the 23d, 2 on the 24th, and 3 on the 26th. Of the 8 cases, 4 proved fatal. During the latter part of December, also, severe outbreaks occurred in the Howrah district, and in villages near Atchipur and Budge-Budge. During December only three cases of cholera, all sailors from vessels in different parts of the river, were admitted in the general hospital, viz., two on the 29th and the third on the 31st December. A case of cholera also occurred in Elysium Row on the 27th December.

The circumstances of the outbreak in Russell Street are as follows :—

"On the 23d December a Mr. T——, his wife, and a Madrasi man-servant, came to the boarding-house from the mission establishment at Bhowanipur, where they had been previously residing. No cases of cholera had occurred on those premises either before they left or, in fact, up to the time the committee made their report. The first case at the boarding-house was that of Mr. T——. He fell ill on the 26th December 1871, at 6 A.M., "but thought that it was only one of his usual dyspeptic fits." After breakfast

he went out with his wife shopping, and returned at 1 P.M., still feeling unwell with purging; vomiting soon came on, and at 5 P.M. he was fast passing into collapse, from which he never rallied; he died at 10.30 A.M. the next day. His wife was taken ill on the evening of the 27th December, and returned to the missionary institution at Bhowanipur. "She suffered from cholerine, checked by full doses of liquor opii sed: and diluted sulphuric acid, and ultimately recovered." The Madrasi servant, who ate and drank the same food and water as his master, was also attacked with cholera on the 27th December. He ultimately recovered, and was the only native about the premises of the boarding-house affected by the disease. These cases occurred in No. 4 Russell Street. A Mrs. H——, residing on the top flat of No. 5 Russell Street, was with Mr. T—— during his illness on Tuesday afternoon, throughout the subsequent night, and on Wednesday morning until his death. "She felt ill during the night, but no symptoms of cholera began till she got home on the 27th; she recovered." Mrs. W——, living on the lower flat of No. 3 Russell Street, was attacked with cholera on the 27th December, and recovered. Archdeacon Pratt, who lived on the second floor of No. 5 Russell Street, left Calcutta on the night of the 25th, and proceeded to Ghazipur. He arrived there at 10 P.M. on the 26th, was attacked with cholera on the forenoon of the 27th, and died on the 28th. In all, there were 6 cases of cholera and 2 deaths."

The immediate neighbourhood of Nos. 3, 4, and 5 Russell Street has been free from cholera, "so far as the European inhabitants are concerned," for months past. These three houses form a boarding establishment under the management of Mrs. Herring, who lives in No. 5 Russell Street; and from a kitchen in this house the food and water are supplied to all the lodgers on the establishment. The locality is healthy and well drained, "and the only feature apparently distinguishing these houses from the others in the immediate neighbourhood is to be found in their water-supply; water is not laid on in them, but is brought in from the nearest stand-pipes. This is done by two bheestees, who bring water to all the houses in their *mussacks*." The milkman supplying milk to the establishment also lives in Bhowanipur. Very many of the houses throughout Chowringi are supplied by milkmen living in the same suburbs. Immediately to the rear of the huts in which these milkmen live there is one of the dirty tanks so common in the suburbs of Calcutta, "and it is almost certain that the milk supplied by the milkman contained the water of some tank."

Nuddea.—In the district generally cholera prevailed sporadically; but in several parts it assumed an epidemic form, in continuance of an outbreak in the preceding December, which did not finally subside till the end of April 1872. The circles of Bongam, Ranaghat, and Birnagar were most severely affected.

Murshidabad.—Cholera pervaded the entire district in this year, but with the greatest severity in its south-west, south, and south-east portions. The registered cases and deaths were less numerous in 1872 than in 1871, viz., 700 and 659 respectively, against 645 and 442 respectively. Of the mortality, 70 per cent. occurred in the above-indicated portions of the district. It was noted that "along the main roads and river-bank, where traffic was greatest, the disease prevailed with less intensity, continuity, and fatality than in the country west of the Bhagirati, which is high, open, and better drained, and, as a rule, free from rank vegetation." With respect to the causes and pathology of the disease in Murshidabad, Dr. Coates writes—

"Cholera is endemic, but more prevalent in the cold and early hot seasons. Anything that disturbs digestion is liable to induce it. New rice, fresh vegetables, fresh fruits, all uncooked food, foul water, and indigestible substances give rise to it. In no case has it been observed to be contagious. I cannot state the effect of caste, age, sex, and habits, except that females are less subject to it than males, and that irregular eating and living seem favourable to its onset."

Darjiling.—In 1872 cholera of a severe epidemic character pervaded the entire district, chiefly exhibiting its virulence among the coolies on the tea-estates, the Terai, particularly the crowded tracts, and the hill country. "On the 27th May the first case, ending fatally, occurred in the bazar at Darjiling, in the person of a Mahommedan carpenter. At the civil surgeon's recommendation, the hut in which this man died was burnt down the same night.

The second and last case in the station was that of a duftry, who was attacked the next day, and who was ascertained to have had no communication with the people of the Terai." In connection with the outbreak of cholera among the coolies employed on the tea plantations, it is stated—

"That in two cases infants at the breast did not catch the infection from their mothers, who were attacked by and died of cholera; that when the huts in which the disease had broken out had been burnt down, the disease disappeared from their locality."

Furridpore.—Cholera prevailed with greater intensity during January in the south portion of the district, "where the river-water, which was being used by the people, was at that time stagnant, and rendered noxious by the bathing and washing of clothes in it." The Commissioner, however, "was of opinion that the occurrence of the disease was inevitable, owing to the misery that had been caused by the inundation, and that it was surprising that its attack was not more destructive." By the end of the year cholera was diffused throughout the district.

Dacca.—Contrary to the experience of the preceding four years, the district at large was singularly free from the ravages of cholera in 1872, excepting in November and December. The first case in the town of Dacca occurred on the 21st March; on the 15th April there were four more cases, with three deaths. No more cases were heard of at this time, nor in May, although the great bathing festival of the Brahmaputra "had collected at a place 15 miles east of the city many thousands of pilgrims from different and remote parts of Bengal." In June and July a few cases were heard of; and in August and September there was an outbreak, with sixteen deaths, among a number of coolies who had come from Monghyr for labour at the jute-factories. The outbreak among them was attributed to "excessive overcrowding, bad food, inordinate eating at unusual hours, and polluted water." The disease then spread all over the city, and continued rife till the close of the year. "Children were attacked in much greater numbers than adults, and, although rare in occurrence in other years, more than one member of a family suffered at the same time in this year." Dr. Wise writes that the natives of Dacca city "implicitly believe that rain in November postpones the annual outbreaks of cholera," and that his own experience corroborates this opinion.

Chittagong.—Cholera prevailed endemically throughout the district during the whole year. "Low-lying damp localities, where the drinking-water was impure and no attention was paid to conservancy, suffered most.'

Patna.—In 1872, "for the first time since 1857, the Mitapur jail was exempt from this disease." It is stated that, with a view to test the efficacy of sanitary improvements in arresting cholera in a locality where it is endemic, a scheme for subsoil drainage of the jail and its precincts, and for providing better worksheds, had been proposed to Government. The Inspector-General of Hospitals disapproved of these measures, on the ground that no satisfactory conclusion could be derived from the improvements in question, unless an efficient system of quarantine was established. The Government of Bengal concurred in these views, but the Government of India was of opinion that the improvements should be carried out in their simple form without quarantine.

"Neither of the plans was given effect to; and considering that no other new sanitary precautions had been inaugurated in the jail during the year, Dr. Simpson lays stress upon these facts as proving the fallacy of the arguments of those who attribute immunity from cholera to either segregation or sanitary improvements."

The mortuary registers show cholera to have been present in the district throughout the year, and to have attained some considerable prevalence in June, July, and August, especially at Behar, Silan, and Attarsarae. In June there was an outbreak at Dinagepore also, which by the 15th July had attacked 41 persons, including a European soldier, and caused 25 deaths. At Dehri the first case occurred, in the jail, on the 23d July, and the last on the 30th August; there were 46 cases, with 14 deaths. "The greatest number of admissions into hospital was on the 30th July, viz., 13 out of 46 cases; and this fact the superintendent is of opinion markedly illustrates the evil effects of chill when cholera is present, for a remarkable sudden fall of temperature took place about that time. It had been raining from the 18th to 28th July; there was, however, no diminution of temperature during this period, but on the 28th the thermometer fell, and continued low up to the 30th, on which day the great and sudden increase of cholera cases above referred to occurred. It was also remarked that while, during this outbreak in the jail, the outside population of Dehri was free from the disease, on the other hand, the jail enjoyed immunity from it during November and December, when the disease prevailed with great virulence in the coolie lines close to the superintendent's house."

"The drainage of the jail is defective, and to this defect the superintendent is disposed to attribute the origin of much of the malarious disease, as well as cholera, that had lately prevailed." It strikes him "that within a limited enclosure, surrounded by walls, and with only two *kutcha* drains as outlets, the soil must, when the rainfall is heavy, become unduly humid—sodden, in fact; and when in that condition, with a subsequently hot sun, and perhaps dry wind passing over it, a greater diminution of temperature must take place."

Chumparun.—Cholera did not prevail epidemically in this district. "Its visits were sudden, and confined to limited tracts, appearing and vanishing from one portion of the district to visit another, and again appearing at the places it had previously visited. Never continuing long at any place, it did not attack large numbers." It is stated, also, that the mortality from cholera was not very great, "and occurred chiefly among the previously ailing and the aged."

Cuttack.—Cholera was prevalent in the district throughout the year. In the town of Cuttack comparatively few cases occurred. "The disease was prevalent chiefly among the pilgrims to and from Poori, along the routes taken by them; and there were a great many cases among some large gangs of coolies employed on irrigation works."

Poori.—"After an entire absence from this district in 1871, cholera visited it during this year." The returns show its presence in every month throughout the year. "Many deaths occurred among the pilgrims who passed through Khonda. On the whole, the disease confined itself to the villages near the main traffic roads."

Meteorology.—The chief meteorological features in Bengal in 1872 are summarised as follows:—(1) Deficient rainfall; (2) weak westerly winds; (3) an increased number of storms in the bay at the beginning and close of the monsoon; (4) diminished atmospheric pressure over the north of the bay, and increased pressure in the south-east of the bay, especially during the first six months. (From Mr. H. F. Blanford's Report.)

1873.—The cholera of this year, instead of abating, prevailed with somewhat greater epidemic frequency than in the year before. The death-rate for the year among the civil population was 0.94 per mille. This continued prevalence of cholera activity among the natives during 1873 was coincident

with a season of prolonged and excessive drought and a rapid rise in the prices of food. The returns for 1873 show an increase of 22,294 deaths from cholera among the civil population as compared with the total number registered among them in 1872. In both years the month of October shows the lowest mortality as compared with the other months of the year. The months of January and December, which in 1872 showed the highest monthly mortality, in 1873 show a very reduced number of deaths, the figures being respectively 4711 and 6314 in 1872 against 3924 and 3422 in 1873.

The following particulars regarding the disease are recorded in the reports of the district surgeons:—

Burdwan.—Cholera prevailed in three of the southern circles in this district at the close of 1872, and continued active in them during January 1873. In February the disease persisted in these three circles, and also appeared in others in the north-east of the district. During both months cholera was present in Burdwan, and is "said to have been more virulent than elsewhere." In the first half of March the disease appeared at Raniganj, on the extreme north-west, and in the east also, and persisted during the month in the south and centre of the district. In April the disease was severe in the south-west, and on the 26th appeared in the women's ward of the Burdwan jail, and on the 29th among the male prisoners. In May there were some severe local outbreaks, but the disease, on the whole, was abating. In June the abatement was more marked; and "after this month the disease gradually diminished, smouldered, flickered, and died out." The features presented by the cholera of 1873 in this district are thus described—"It was frequent in occurrence, limited in extent, of short duration, and erratic in manner, proceeding from village to village, and returning to already-visited localities after a week or so, and attacking a few at a time. It was present somewhere or other during every month of the year except the two last, and was most fatal in January, March, and June. It prevailed with less severity in the north of the district than in the south and east."

Bankura.—"The cholera of this year was sudden in occurrence, and of a virulent type. It visited principally the villages and towns situated along the road by which pilgrims travel, . . . which are favourite resting-places for the weary and afflicted. . . . The disease was also rife among the poverty-stricken, and in localities where the laws of sanitation are least observed."

Rajshahye.—"Commencing in January, the cholera of this year appeared to have acquired fresh intensity in February, rapidly increased in March, and attained its maximum in April. Gradually declining in May, it suddenly disappeared about the end of June, probably owing to the setting in of the monsoon. It reappeared in November, and became most virulent in December."

Maldah.—"Cholera prevailed in this district extensively and most fatally, but with varied intensity, throughout the year. . . . The disease first appeared in January, in a sporadic form, in the town and the south-eastern parts of the district. . . . In March it prevailed everywhere, except in Nawabganj and Shibganj. From June the disease abated in intensity, and gradually died away. In December, however, it again appeared in some parts of the district, but in a milder form."

Dacca.—"Cholera had not visited this district epidemically since 1869; but during this year a very general and severe epidemic occurred, equal in virulence to those that took place in 1864 and 1861. Since 1817 this scourge has been a visitant of this district, and it is believed that it breaks forth with special virulence every fourth year; that it is always to be met

with in those months when the diurnal variations of temperature are greatest, and when the south-west and north-east winds blow strongly; and that it appears in an exceptionally severe form after an early subsidence of inundation. During 1873 the rain-floods at their highest were lower than they had been for years, and cholera appeared at an earlier date after the rains than usual."

Backergunge.—"Cholera, which is endemic here, assumed an epidemic form in 1873, and visited most parts of the district, particularly during the hot weather and during December and January, the two coldest months."

Patna.—"Epidemic cholera of a severe type appeared in several parts of this district in 1873. Except in the city of Patna, where the disease lingered longer than elsewhere, the time of prevalence was during the hot months, from March to September inclusive. . . . At Behar the disease broke out with great virulence immediately after the subsidence of the inundation of the town, which was caused by a heavy fall of rain, the severity of the attack being most marked in those parts of the city which lie at the lowest level, and were therefore most affected by the floods."

Gya.—"Cholera was present in this district during the greater part of the year, and to it, in a secondary degree, is due the high mortality. During the rains the disease was more or less epidemic throughout the district; no part of it escaped. In August it was at its highest. It was reported to have broken out simultaneously in different parts of the district, and in places removed from the ordinary lines of traffic."

Shahabad.—"Cholera, epidemic in character, prevailed during the year in every subdivision in this district. It appeared in serious form in April, became diffused in various parts of the district in May, increased considerably in incidence towards the middle of June, particularly in the vicinity of Arrah, and attained its maximum in July. The outbreak lasted up to November, and the mortality that attended it was considerably in excess of that of the preceding year. . . . Notwithstanding all the precautions that were taken to exclude the disease from the jail by enforcing strict attention to cleanliness, isolation, careful examination of food, allowing extra salt, and keeping prisoners under surveillance, so as to send any to hospital the moment they appeared unwell, cholera entered the prison on the 25th June, and continued in it until the 5th July. It attacked fifty-six prisoners, of whom eighteen died. Every step was taken to stamp out the disease. The sick were isolated, their dejecta and excreta were promptly removed to a distance from the jail, sulphur fires were burnt in the wards and in the jail hospital, and immediate attention was afforded to those who were attacked. Alarm caused many prisoners to conceal their illness, thus greatly diminishing the chances of recovery. At last it was deemed expedient to remove the prisoners from the jail, and on the 4th July they were taken to the large building north of the police lines and Basea road. This step put an end to the outbreak in a very striking manner, as only two prisoners (the last of the cases) were attacked the next day, the 5th, and one of them was found, on inquiry, to have had the disease before he left the jail. All the sanitary arrangements of the jail were in good order; there was no overcrowding worth the name. This outbreak cannot, therefore, be assigned to any other cause than the very unhealthy and unseasonable weather of June and July. As illustrative of the non-contagious character of cholera, it may be mentioned that the four prisoners who were employed as sick attendants, and who had worked night and day throughout the entire outbreak, were not affected by the disease; and that of sixteen others who were similarly employed for short periods, only one was attacked."

Tirhut.—"Cholera prevailed in an epidemic form in this district during the months of March to September. The cases were a good deal scattered, and the outbreak was not very severe in any locality. The villages that fared the worst were those situated in the north-west, west, and south-west of the district."

Sarun.—"Cholera as an epidemic visited this district in June, July, August, and September. The lower classes, the poor, ill-fed, and intemperate are said to have been especially attacked."

Chumparun.—"Cholera was present in this district, but confined to limited localities, during eight months of the year, the months of immunity being January, March, April, and December. From the latter end of July to the end of August it was very severe—almost epidemic in character—and caused a mortality that created great alarm. . . . Cases of sporadic cholera are of frequent occurrence, owing to dietary indiscretions, especially during the marriage months, when the poor, who are living in a state of semi-starvation at other periods, gorge themselves with the most heterogeneous articles in the shape of food; purging and vomiting in a severe form results, and unless the person attacked is of a strong robust frame, his surrounding conditions are altogether against his recovery."

Monghyr.—"Cholera was present in this district throughout the year. In the earlier months the cases were not numerous, but in April the disease assumed an almost epidemic form, and continued its ravages until October, exhibiting its worst features in May, June, and July."

Bhagulpore.—"Cholera, in some cases in epidemic form, broke out in this district in March, and ceased by the end of June."

Purneah.—"Cholera broke out in this district in a severe form in March, prevailed with the greatest intensity in April, and disappeared in June. . . . About a fortnight after the Caragola fair, and while the Moharram festival was being observed, cholera of a severe, but not of a virulent, character broke out in the villages along the Ganges and Darjiling road, to which part it was chiefly confined. Not a case occurred while the fair lasted, nor is there any evidence of importation. Women and children suffered more than men. The disease commenced abating in about the end of April." A list of twelve villages which were affected is given, showing the prevalence of the disease in each; the total number of cases is 802, with 596 deaths. "A few cases of cholera also occurred in the native town to the north of the station, but the disease did not pervade the station or appear in the jail."

Sonthal.—"Several outbreaks of cholera occurred in this district during the year. They were in most cases of very brief duration, ceasing almost before the places could be visited. . . . These outbreaks were for the most part ascribed to heat and want of rain. The insanitary state of the affected localities and the filthy habits of the people formed also main features in inducing the disease."

Cuttack.—"Cholera, as usual, visited the district in February, soon after the pilgrims flocked in for the first Poori festival, and again in March, in which month the Dolijatra takes place. It continued its ravages up to August, after which it rapidly declined. The peculiarity of the disease is to confine itself to localities which are pilgrim routes and pilgrim resorts."

Poori.—"Cholera of a mild type, seldom ending fatally before three days, and attended with comparatively less mortality than in former years, broke out in this district in January, declined with the cessation of the rains, and finally disappeared by the end of July. . . . There were two distinct outbreaks of this disease. The first occurred in the second week of January,

and was imported by pilgrims from the Nilgiri subdivision of Balasore. . . . By the end of March this outbreak was extinct throughout the district. The second outbreak occurred early in June among pilgrims on the trunk road and in Poori, beginning at a lodging-house for pilgrims, and spreading rapidly throughout the town and in several parts of the district. This outbreak ceased by the end of July. The number of pilgrims this year was considerably larger than in many years past."

Balasore.—"Cholera visited various parts of the district during the year, and was attended with a large mortality."

Hazaribagh.—No report of cholera received from the civil surgeon of this district; but the mortuary returns show a total of 328 cholera deaths during the year against 111 in 1872.

Lohardugga.—"Cholera was present during the year in sixteen out of the twenty-three registering areas of this district. It was of brief duration in every place except Ranchi, where it appeared early in June, and did not finally disappear until the beginning of September."

Singbhum.—"Cholera was present in this district throughout the year. It assumed an epidemic form in July and August in the eastern part of the district, bordering on Midnapore, and advanced in a westerly direction towards Chaebasa and Saraikila."

Manbhum.—"Cholera prevailed in this district during the year, but not epidemically. The mortality was, however, considerably in excess of the preceding year—in fact, thrice as great," the figures being 840 in 1873 against 289 in 1872. In June "cholera of a virulent type broke out in the village of Gobindpur and in the bazar. In that month forty-three were attacked, and twenty-three died. . . . On the 6th July the disease appeared in the town of Purulia, in the bazar, and continued almost throughout the month. It was confined to the lower or eastern portion of the town, which is also the poorest. It was observed that the people of this place drank the water of tanks which were almost dry, instead of resorting to the beautiful lake to the north of the bazar. The mortality that resulted from this outbreak was very high." . . . The civil surgeon writes—

"This morning, in going my rounds, I was told that a native was lying a little way off the highroad leading out to Raniganj. I went to the place, and saw a man in a state of collapse; and he assured me that he had been lying there all night exposed to the heavy fall—2 inches and 57 cents—of rain. His clothes were still wet. His story was that, being seized with symptoms of cholera yesterday evening, he was turned out by his host. The latter, singularly enough, has now cholera, and is by far in a worse condition than the man whom he turned out of his house in such a heartless manner."

Meteorology.—"At the close of 1872, except in the Central Provinces and Eastern Bengal, there existed an abnormally high rate of temperature, which in Orissa and Hazaribagh was maintained till the end of April. In May the heat became excessive in Lower Bengal. In June the heat, instead of moderating as in ordinary years, remained as intense as in May, and in some cases exceeded it. In July the rain reduced the temperature to a very little above the average, and in Orissa to a little below it. In September the heat in Bengal was above the average; in October it was below it. In November, and still more in December, the weather was warmer than usual.

The quantity of vapour in the atmosphere, save in a few unimportant and exceptional cases, was less than usual; and owing to this and the prevailing high temperature, its tendency to precipitation as rain was comparatively small. The rainfall of 1873 was deficient almost everywhere, and uniformly so throughout the year, Hazaribagh and Ranchi being almost the only exceptions.

1874.—For this year and the two following the prevalence of cholera among the civil population of the Bengal Province is illustrated by the deaths registered from that disease in "selected areas," urban and rural, in each district of the province. The population, area in square miles, and population per square mile of each class of these "selected areas" in the several districts are shown in the subjoined tabular statement.

STATEMENT *showing the Population, Area in Square Miles, and Population per Square Mile of each Class—Urban and Rural—of the "Selected Areas" in the several Districts of the Bengal Province in* 1874.

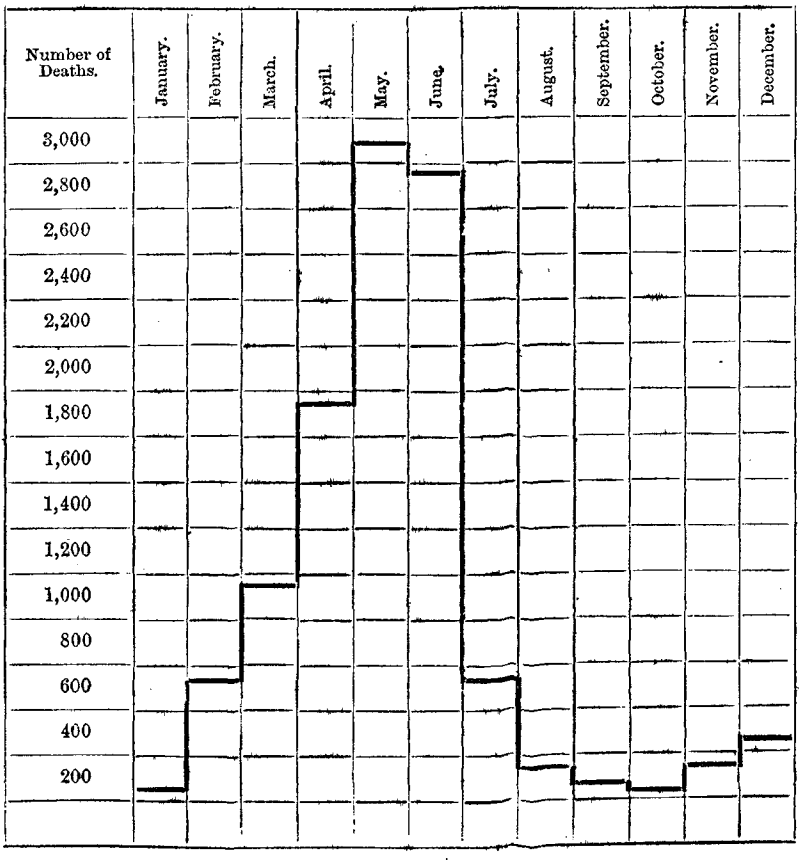
Districts.	Population.				Total.	Area in square miles.			Population per square mile.		
	Urban.		Rural.								
	Males.	Females.	Males.	Females.		Urban.	Rural.	Total.	Urban.	Rural.	Total.
Burdwan . .	16,290	16,031	51,646	50,359	134,326	6	194	200	5,386	525	671
Bankura . .	18,918	18,731	7,640	7,692	52,981	33	28	61	1,141	547	869
Beerbhum .	4,617	4,384	33,669	36,499	79,169	5	235	240	1,800	293	3·9
Midnapore .	16,110	15,381	72,199	73,065	176,755	6	437	443	5,079	332	389
Hooghli and Serampore	31,791	31,799	19,742	21,567	104,899	11	47	58	6,359	860	1,808
Howrah . .	54,698	43,686	12,544	13,071	123,399	12	4	16	8,148	6,403	7,712
24-Pergunnahs	14,348	12,915	9,336	8,766	45,365	7	18	25	3,845	1,011	1,815
Nuddea . .	12,871	13,879	10,484	10,190	47,424	7	33	40	3,821	626	1,185
Jessore . .	4,639	3,513	5,771	5,806	19,729	4·78	6	10·78	1,705	1,929	1,830
Murshidabad.	2,600	2,303	2,212	2,439	9,554	0·88	4·13	5·01	5,544	1,134	1,906
Dinagepore .	7,700	5,342	7,064	5,579	25,685	4·15	13·16	17·31	3,142	961	1,484
Maldah . .	9,000	9,121	5,726	6,832	30,679	3·91	6·75	10·66	4,634	1,860	2,878
Rajshahye .	4,939	4,735	10,980	11,100	31,754	3	35·82	38·82	3,224	616	817
Rungpore . .	9,885	4,960	4,325	3,954	23,124	5·13	19·19	24·32	2,893	431	950
Bogra . . .	3,343	2,529	6,472	6,664	19,008	1·33	26·50	27·83	4,415	495	683
Pubna . . .	7,851	7,879	9,390	9,886	35,006	2	10	12	7,865	1,927	2,917
Darjiling . .	2,108	1,049	6,403	4,854	14,414	1·97	62·71	64·68	1,602	179	222
Julpaiguri .	3,837	2,444	24,468	23,717	54,466	6	164	170	1,046	293	320
Dacca . . .	50,246	41,419	19,563	21,753	132,981	18·09	20·42	38·51	5,067	2,023	3,453
Furridpore .	6,808	4,735	5,907	6,664	24,114	6·73	7·45	14·18	1,715	1,687	1,701
Backergunge .	10,117	4,107	7,004	6,648	27,876	10·48	22·68	33·16	1,355	601	840
Mymensingh .	24,062	20,155	13,365	13,176	70,758	16·72	26·2	42·92	2,643	1,013	1,640
Chittagong .	14,499	10,761	13,707	16,411	55,378	9·75	62	71·75	2,590	485	771
Noakholli . .	5,777	4,286	5,490	5,038	20,591	3	24	27	3,354	438	762
Tipperah . .	7,999	4,949	6,328	6,036	25,312	4·63	?	4·63	2,796	?	?
Patna . . .	44,218	47,081	15,593	16,825	123,717	3·609	26·757	30·366	25,361	1,212	4,075
Gya	39,206	40,253	152,252	153,327	385,038	13·29	536·14	549·43	5,978	596	701
Shahabad . .	6,706	6,842	9,514	5,033	28,095	8	25·76	33·75	1,694	564	832
Tirhut . . .	62,671	57,959	25,249	23,749	169,628	14	12·30	26·30	8,616	3,983	6,449
Sarun . . .	28,408	28,978	19,651	20,516	97,553	11	45·50	56·50	5,216	882	1,726
Chumparun .	16,015	11,959	2,183	2,245	32,402	10·91	2·56	13·47	2,564	1,729	2,405
Monghyr . .	12,670	13,604	10,081	10,345	46,700	1·66	23	24·66	15,827	888	1,894
Bhagulpore .	15,333	14,815	5,565	3,853	39,566	2·93	13·84	16·77	10,289	680	2,389
Purneah . .	12,701	9,500	10,167	9,577	41,945	20·53	147	167·53	1,081	124	250
Sonthal . .	9,502	9,781	11,232	11,184	41,699	49	113·5	162·5	393	197	256
Cuttack . .	36,262	36,051	7,159	7,675	87,147	28·55	17·53	46·08	2,532	846	1,891
Poori . . .	12,077	10,618	5,248	5,081	33,024	2·87	23·06	25·93	7,905	447	1,275
Balasore . .	9,029	9,234	5,674	5,716	29,653	6·5	27·1	33·6	2,809	420	882
Hazaribagh .	10,599	9,269	3,887	3,569	27,324	4·52	33·14	37·66	4,396	225	725
Lohardugga .	6,860	5,226	9,352	9,588	31,026	3·60	80·5	84·10	3,357	235	368
Singbhum. .	2,534	2,289	11,537	11,848	28,208	1	231	232	4,823	101	120
Manbhum. .	3,026	2,670	27,563	25,697	58,956	3	260·13	263·13	1,898	204	224
Totals and Averages	672,270	607,222	703,342	703,594	2,686,428	8·86	74·42	83·27	21,767	540	766

The general mortuary returns of the province, being considered unreliable, have not been published with the Annual Sanitary Report for 1874. In their stead appear the statistics of the above "selected areas." These statistics are considered "approximately correct, and therefore worthy of permanent record." The monthly cholera mortality registered in these "selected areas" during 1874 is shown in Table No. II., and its distribution by districts in Table No. I. The total number of cholera deaths registered in the "selected areas" is 6345, or at the rate of 2.36 per mille of the population of the areas dealt with.

Of the above number of deaths, 3418, or 2.67 per mille of population, were returned from the urban, and 2927, or 2.08 per mille, from the rural areas. Exclusive of these deaths in the "selected areas," a total of 50,531 deaths from cholera, or 0.88 per mille of the population, were registered during the year in the remaining areas of the province. Of these deaths, 902, or 1.30 per mille of the population, were registered in the town, and 49,629, or 0.87 per mille of the population, in the rural circles of the general area of the province. The total deaths registered from cholera during 1874 amounted to 56,876, or 0.94 per mille of population. The returns show "that the prevalence and fatality of cholera in 1874 were somewhat less severe than in the preceding year, and that the rural areas suffered in 1874 to a greater extent than the urban areas in both the selected tracts and the general registering circles, but that in 1873 the reverse was the case in the selected tracts. . . . The cholera of the year under review was less severe, less widespread, and less extensively epidemic than that of the preceding year. It was present, however, in every district." That the cholera of 1874 in the Bengal Province was an abating cholera is also borne out by the returns of the incidence of the disease among the troops and jail populations (see Table No. V.), the death-rate among these classes together being 4.83 per mille of strength against 5.65 in the year before. This abatement of cholera in 1874 was coincident with a return of the usual rainfall, but with a continued rise in the prices of food, which approached famine rates.

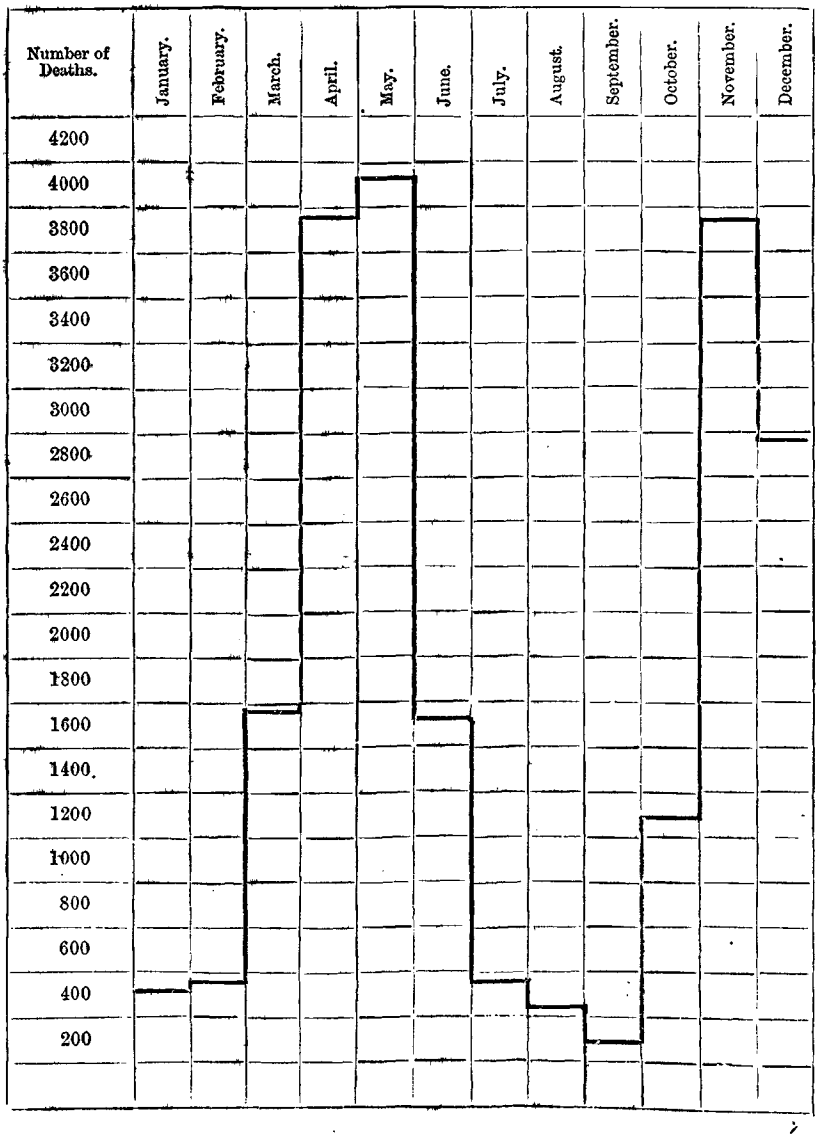
Although the cholera of 1874 was very generally diffused over the province, the monthly prevalence and fatality of the disease varied greatly in different parts of the province. These peculiarities are illustrated by a series of diagrams, which, as Dr. J. M. Coates, Sanitary Commissioner for Bengal, observes in Section III. of his Sanitary Report for 1874, "show in a clearer manner than any array of figures the monthly prevalence and fatality of the disease as it existed in the different circles or commissionerships into which Bengal is divided, and in the urban and rural circles of the province." These diagrams are here reproduced as the most eloquent expositors of the recorded deportment of cholera in the Bengal Province in 1874, and also as a general index to the ordinary seasonal prevalence of the disease in these several parts of the province.

Cholera in the Western Circle—(Burdwan Division).



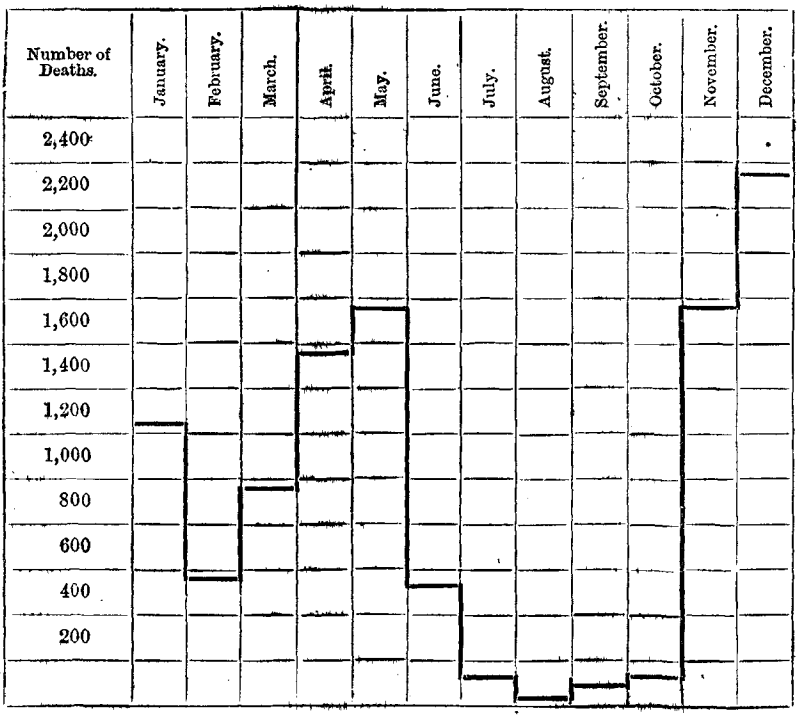
Total mortality 1·62 per 1000 of population.

Cholera in the Central Circle—(Presidency, Rajshahye and Kuch Behar Divisions).



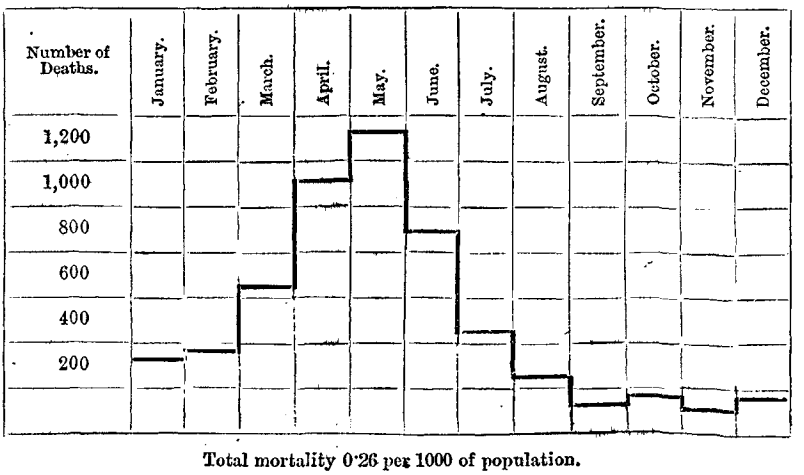
Total mortality 1·43 per 1000 of population.

Cholera in the Eastern Circle—(Dacca and Chittagong Divisions).



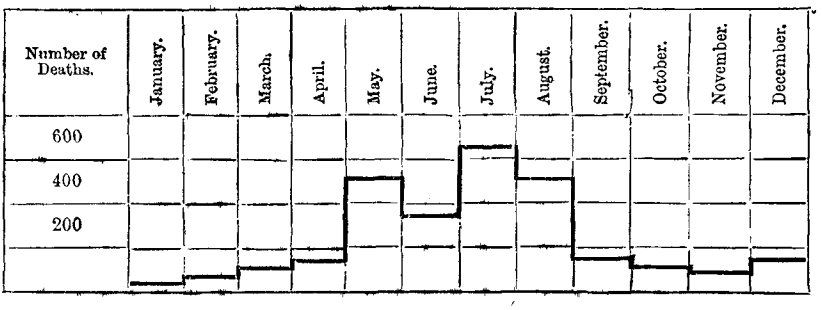
Total mortality 1·02 per 1000 of population.

Cholera in the Behar Circle—(Patna and Bhagulpore Divisions).



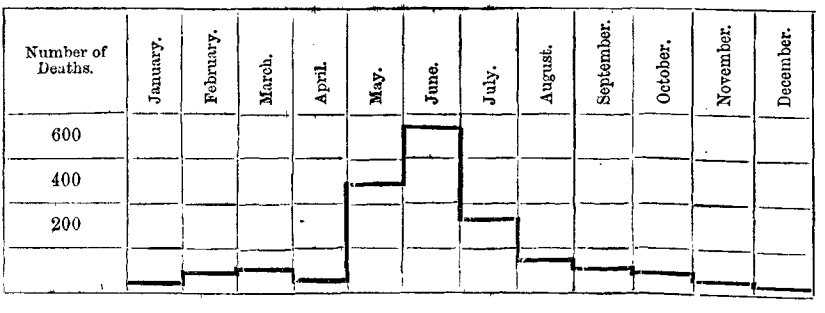
Total mortality 0·26 per 1000 of population.

Cholera in the Orissa Circle or Division.



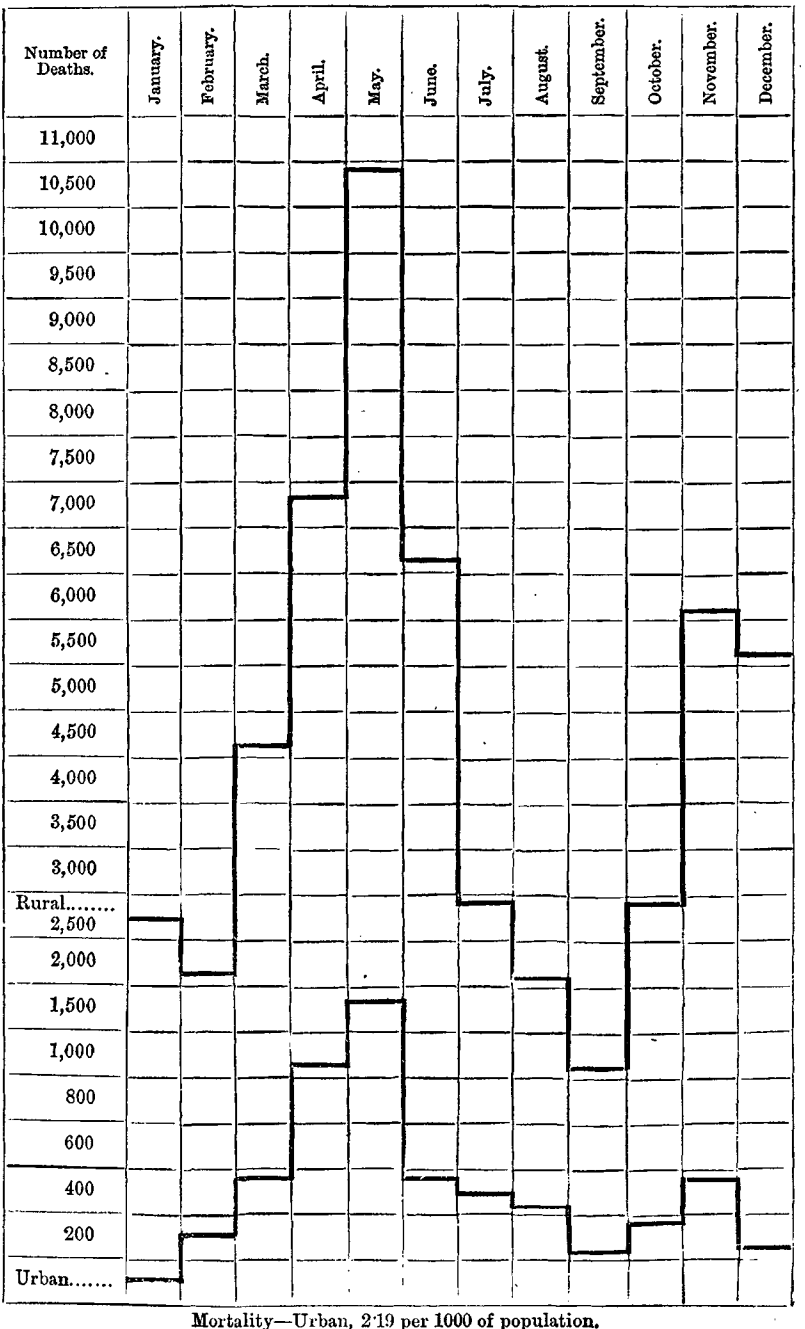
Total mortality 0·88 per 1000 of population.

Cholera in the Chota Nagpore Circle or Division.



Total mortality 0·58 per 1000 of population.

Cholera in the Urban and Rural Circles of the Province—1874.



Mortality—Urban, 2·19 per 1000 of population.
" Rural, 0·90 " " "
" Total, 0·94 " " "

Regarding the course of the cholera of 1874, it is stated that, on the whole, the districts were comparatively free from cholera during the earlier months of the year; that in some of the districts where it did prevail, it was a continuation of the disease which was developing in intensity at the end of the preceding year; that the disease prevailed with much severity in the hot months, for the most part from March to June, before the rains had properly set in; that it increased in intensity month by month, and was epidemic in the western and eastern circles, and very severe in the central; that it culminated in severity and fatality in May, and commenced abating from June; that a comparative lull took place in September; that the disease appeared again in the cold months of October, November, and December, particularly in the eastern and central circles, and was very severe in November, but not to the same extent as in the hot season.

The causes which originated, fostered, and propagated the cholera of this year, as gathered from the reports of the civil surgeons, appear to have been, as it is stated—

"Bad, foul, and deficient water-supply; . . . prolonged inundations or impeded drainage retaining moisture and damp in the ground, and emitting noxious effluvia; malarious or vitiated air in the vicinity of low-lying marshes, or pits, hollows, &c., containing exposed and putrescent vegetable and animal matter; insanitary conditions of special localities; deficient ventilation; errors of diet, such as the use of new rice, decayed and putrid fish, raw fruit and vegetables, or decomposed food; congregation of large bodies of people at the famine-relief centres, on pilgrim routes, or in pilgrim resorts and fairs, during months of excessive heat. There were instances, also, in which the introduction or dissemination of the disease was ascribed to importation or contagion." Again it is stated—"It was observed that wherever rapid communication and a comfortable mode of conveyance occur along a pilgrim road, as at Gya and Parasnath, cholera decreased, and did not spread to the people generally. . . . The fatigue and exposure, the bad or improperly cooked food, the dirty water, and the filthy resting-places, directly cause bowel congestions and cholera attacks among the Poori pilgrims. Another most potent cause of cholera among the Poori pilgrims has recently been discovered." It was the foul water "which the duped pilgrims are made to drink copiously" from a cistern which received the washings from the paved floor of the inner temple of Jagannath. The floor is washed after each offering of food to the idol, "and the washings carry down the filth of all human feet treading inside the temple, with small quantities of boiled rice and other articles prepared with ghee, molasses, &c., spilt on the floor in being carried to and from the front of the images." These washings run into a cistern or sink, which, on examination, was found full of water; and in sounding the depth with a bamboo probe, "the water was disturbed, sending forth noxious exhalations, the breathing of which is highly deleterious. . . . This collection of the washings is continued from month to month and from year to year. In clearing it a cartload of filth was found silted at the bottom." A sample of the water was submitted to the chemical examiner, who reported—"No analysis performed so far away from the source of the water can be satisfactory. The present specimen is so foul and putrid as to resemble sewage rather than drinking-water. It contains sulphuretted hydrogen sufficient to blacken lead-paper immediately it is exposed to it, and requires thirty-four parts of oxygen per millim to purify it."

The rainfall of 1874, although greatly more abundant than the exceptionally deficient fall of the preceding year, was still slightly below the average, and it was, moreover, irregularly distributed in its seasonal fall (see Table No. V.). The falls in the first and last quarters of the year were unusually copious for those periods, as was also the fall in the second quarter, whilst that of the third was remarkably deficient. The prices of food ranged high everywhere, and in many districts there was severe distress from famine. Nevertheless, the year being that of minimum cholera prevalence, as the third of the triennial cycle 1872–74, the activity of the disease in epidemic form was aggravated in those districts only which suffered most from drought and famine.

1875.—During the year 1875 the population of the "selected areas"

differed slightly in number, owing to a new classification and arrangement, from that of 1874; but as these changes were made only in a few circles, they have not affected the total population of the general circles; "and with regard to the 'selected circles,' they do not, on the whole, disturb the general results to any material extent." For statistical purposes, therefore, the tabular statement furnished for the preceding year may be held to apply to this year also. The total of cholera deaths registered in these areas is 7704, or at the rate of 5.76 per mille of the population of the "selected areas" to which these returns refer. The total population in which these deaths were registered is given at 2,688,076, viz., males 1,378,165, and females 1,309,911. In the urban circles—population 673,976 males and 609,987 females, total 1,283,963—there were registered 4365 deaths from cholera, viz., 2956 males and 1769 females, the ratios per mille of population being respectively 3.39 and 3.85 and 2.90. In the rural circles—population 704,189 males and 699,924 females, total 1,404,113—the deaths registered were 3339, viz., 1806 males and 1533 females, the ratio per mille of population being respectively 2.37 and 2.56 and 2.19. Inclusive of the deaths registered in the "selected areas," the total number of deaths registered from cholera in 1875 was 108,262, or 1.80 per mille of the population, against 56,876, or 0.94 per mille in 1874, and 59,830, or 0.94 per mille, in 1873. Of the deaths in 1875, there were returned from the urban circles 5474, or 2.77 per mille, and from the rural circles 102,788, or 1.77 per mille. The results in the "selected areas," as compared with those of 1874, are as follows:—

For the urban circles, 4365 deaths in 1875 against 3418 deaths in 1874.
For the rural circles, 3339 ,, ,, ,, 2927 ,, ,,
For the combined circles, 7704 ,, ,, ,, 6345 ,, ,,
Ratio per mille of population, 3.39 for urban circles in 1875 against 2.67 in 1874.
,, ,, ,, 2.37 for rural ,, ,, ,, 2.08 ,,
,, ,, ,, 2.86 for combined ,, ,, ,, 2.36 ,,

The most noticeable feature in the history of the cholera of 1875 in the Bengal Province is its wide prevalence. No single district in the province escaped altogether, and in those which suffered most this cause of death may be said to have been in operation all the year round. The figures above given, taken in connection with the reports of district medical officers, indicate that cholera prevailed with great severity in Bengal during the year 1875, more than one-fifth of the deaths being attributed to it, and that the death-rate from this cause, making due allowance for improvement in registration of deaths in the general circles, was greatly in excess of that of the preceding year. The death returns show that there are two distinct periods of the year, as has been frequently noticed in previous reports, in which cholera prevails with greater intensity in Bengal, viz., in the hot season, from March to July, and in the last two months of the year. The degree of prevalence of cholera and the number of circles affected in each month of 1875 are shown as follows:—

Months.	Deaths.	Circles Affected.	Months.	Deaths.	Circles Affected.
January . . .	4,993	211	July	6,140	322
February . . .	5,580	236	August . . .	4,297	263
March	11,191	365	September . . .	2,623	242
April	12,395	367	October . . .	5,425	274
May	10,695	325	November . . .	18,363	426
June	7,998	360	December . . .	18,562	442

In January the disease was present in 211 circles of 34 districts. From February it gradually spread over the districts, increasing also in intensity, until April, when 367 circles in all the 44 districts were suffering. In May the disease began to decline, and continued to do so month by month till the minimum prevalence of the year was reached in September. In October there was again an increased prevalence of cholera, the mortality being more than double that of the preceding month, and about equalling that of February. In November this increase was considerably more than trebled, and the mortality continued at this high degree of intensity during December. In these two months the disease was present in all the districts. The district that suffered most from cholera in 1875 was Nuddea. The disease prevailed throughout the year in all of its 33 registering circles, "and, as usual, was specially fatal in what may be called the drying months, February, March, and April, and again in November and December." The mortality from this cause in the entire district, and for the whole year, was 5.48 per mille of population, and 999 out of the 3691 villages were attacked.

In the Jessore district, also, cholera prevailed throughout the whole year, and in 1352 out of its 4247 villages. "Here also the same periods of endemic intensity occurred—March and November—with similar intervals of subsidence—July to September. The malady was not confined to any locality, but the cases were scattered over the whole district."

Similar remarks, it is stated, apply to the 24-Pergunnahs district; "but the disease increased and declined with less suddenness, and the number of cases were spread more evenly over each month, though there was a decided lull in July, August, and September." The reported number of deaths from cholera amounted to 7109, and 1330 villages out of 4991 in the district were affected.

The Dacca district also suffered severely from cholera, the disease having been reported from 1275 out of its 5016 villages. "There was a more even distribution of the disease over the months from January to June, and a sudden increase from the end of September to the middle of November. . . . At the two large fairs held in the district there was a comparative absence of the disease."

In the Julpaiguri district cholera "prevailed from April to December, and, unlike the foregoing districts, manifested greatest intensity in June and October. From April to the close of the year the disease was more evenly spread over those months, and there was an almost total absence of it in the first quarter of the year. In the latter end of April very virulent outbreaks of the disease occurred simultaneously at Boda and Olipur, which are situated at opposite extremes of the district—the former on the Dinagepore frontier, and the latter on the skirts of the Terai, about 20 miles south of the cantonment of Buxa." Another outbreak occurred at the railway works at Mandalghat, 3 miles south of the Sadr station. Of 250 villages, 90 were visited by cholera.

The districts of Chittagong, Noakholli, Tipperah, Furridpore, and Backergunge all suffered severely from cholera, and the seasonal incidence of the disease corresponds with that observed to occur in the districts of the Dacca division. The subjoined statement shows at a glance the wide prevalence and fatality of cholera in the above-mentioned districts :—

Districts.	Number of Deaths.	Ratio per 1000 of Population.	Number of Circles Attacked.	Number of Villages Attacked.	Number of Villages in the District.
Chittagong . .	875	0·77	10	174	1,088
Noakholli . .	2,204	3·08	8	364	2,034
Tipperah . .	2,222	1·44	14	577	6,150
Backergungé . .	3,002	1·60	15	458	3,244
Furridpore . .	3,303	2·17	13	973	3,332

In the Cuttack district deaths from cholera were reported in every month of the year; but the disease was much more general and fatal from March to December, June, July, November, and December being the months of greatest fatality. The disease was reported in 10 out of 12 circles, and the total of deaths reported during the year was 4102. Compared with the returns for 1873 and 1874, cholera was unusually prevalent in 1875 after the month of September. The chief pilgrim route from Northern and North-Western India passes through this district, and several minor routes join the main road from the West. There is also a constant stream of passengers from the new port of Chandbally through Kendrapara to Cuttack.

Regarding cholera in the Poori district, it is stated that "there are special circumstances connected with this district and its chief town of the same name which enhance the value of all observations bearing on the origin, progress, locality, and seasonal activity of cholera. The town of Poori, containing the temple of Jagannath, is the goal to which constant streams of pilgrims converge from Northern, Western, and Southern India. It is periodically thronged to overcrowding by poor and wearied travellers, and this overcrowding occurs at the most inhospitable season of the year. Cholera is a yearly visitor in the district, and its occurrence is invariably attributed to importation by pilgrims." Cholera was present in the district in all the months except January, but, "unlike the districts of the Presidency and Dacca divisions, the period of endemic intensity occurred in July, August, and December, instead of March, April, and November." The total of cholera deaths registered in this district during the year is 1906. The circles in which the disease prevailed most were Poori, which returned 4.81 deaths per mille of population; Pipli, 2.16, and Khurda, 1.94. It is through these circles that the chief pilgrim routes pass. The Banpur and Tanghy circles, through which a small number of pilgrims from the south travel, returned a death-rate of 1.82 and 2.60 respectively. The Gop circle, to the eastward of the district, through which no pilgrims pass, gives a death-rate from cholera of 0.41. In this last circle, however, registration, it is stated, is least advanced, for the deaths from all causes are little more than half those returned from the other circles.

In Balasore cholera prevailed all over the district and throughout the year; the time of the endemic intensity of the disease was March and November, yet it was generally severe from February to July inclusive, and during the whole of the three last months of the year. The chief route for pilgrims from Northern and North-Western India passes through the whole length of the district. The total cholera deaths of the year is given at 2776. The highest death-rate occurred in the Baliapal circle, which has no pilgrim route passing through it. The death-rates per mille of population of the circles most severely affected were as follows:—Baliapal 12.76, Chandbali 4.54, Dhamnagar 3.84, Jaleswar 3.21, and the town of Balasore itself 7.93.

In the Midnapore district cholera was present all the year round, but in severe form in the first four months only. February and March were the most fatal months; from May to November inclusive the disease did not occur with severity, though there was a slight increase of prevalence in June, and again in November and December. The disease was reported from 25 of the 26 circles in the district; the severest mortality occurred in the following circles:—Kontai at the rate of 16.58 per mille of population, Nandigram 5.91, Bhagwanpur 4.69, Kedgeree 3.63. Though this district is traversed by the great stream of pilgrims to Poori from the north and north-west, the circles which suffered most from cholera, lying as they do to the eastward of the district, are not traversed by pilgrims in any number.

All the districts of the Rajshahye and Kuch Behar divisions suffered from cholera in 1875, but in different degrees of severity, as is shown in the subjoined statement. Except in Darjiling and Julpaiguri, which last has already been referred to, cholera was present all the year in these districts. The seasonal activity of cholera in these districts is somewhat different from that of the more southern districts of the province, for the disease did not, as a rule, reach its maximum intensity till April, and in the case of Rungpore till May; but November was the most fatal month. In the Darjiling district some of the tea plantations suffered severely from cholera. Here follows the statement above mentioned:—

Districts.	Cholera Deaths.	Ratio per 1000 of Population.	Number of Villages in District.	Number of Villages Attacked.
Dinagepore . . .	1,268	0·84	7,108	?
Maldah	1,712	2·53	2,100	382
Rajshahye . . .	1,247	0·95	4,228	176
Rungpore . . .	5,664	2·63	4,206	1,225
Bogra	1,888	2·73	2,666	512
Pubna	2,153	1·77	2,792	1,661
Darjiling . . .	150	1·58	?	?
Julpaiguri . . .	1,353	?	250	90

In the districts of the Bhagulpore division the seasonal prevalence of cholera differs from that of the districts already considered, and seems to observe a less constant rule in regard to its increase and decline; at the same time, the periods of prevalence are more decidedly marked, and the intervals more defined, whilst, further, the disease appears to be less general over the whole area of the districts. Thus in Monghyr no death from cholera was registered in January, in February only 1, in March 28, and in April 79; in May the deaths rose to 424, and in June to 778; from June till September there was a decline in the number of deaths, in October a slight increase, and then again a steady decline till the end of the year; there were but 32 deaths in December. The disease was present in every circle of the district. In Bhagulpore there was but 1 death from cholera registered in each of the first three months of the year; 224 in the next three months; and in the rainy season, from July to October inclusive, 1406; in November 82, and in December only 3 deaths were registered. All the 13 circles of the district were affected, but in 3 of them the disease prevailed slightly. In Purneah, which borders on the Rajshahye division, the seasonal prevalence of cholera resembles that of the districts of Rajshahye, the greatest mortality being in March, April, and May; then a gradual decline till November, and

an almost free interval from December onwards. The total cholera deaths registered were 2480, and 299 villages out of 4179 in the district were affected. In Sonthal district the seasonal prevalence of cholera is very similar to that observed in Bhagulpore and Monghyr; from May to October was the season of greatest mortality; from November to April there were a few sporadic cases in the district. The total mortality registered is 1005; only 198 villages out of 9634 were affected.

The districts of the Patna division were more severely visited by cholera in 1875 than in 1874, and Gya suffered most. In the Patna district the disease prevailed throughout the year, but in sporadic form the first two months. In March there was an increase till June, when the greatest mortality of the year was reached. After June the majority of the deaths occurred in the city of Patna and the adjoining unions of Dinagepore. The total deaths registered were 2062, and 624 villages out of 5242 were affected. In Gya district the disease existed throughout the year, except in February; it was most severe in the south of the district, and a part in the north of the district was entirely free of it; many villages on the banks of the Sone were affected. The total deaths were 3505, and 303 out of 6530 villages were affected. In Shahabad district cholera was present in every month except January and December, and affected all the 15 circles. June was the most fatal month, as in Patna and Gya. The total deaths were 1346, and 247 out of 5110 villages were affected. In Tirhut district (Mozufferpore east and Durbhunga west) registration was still very defective, and "affords very little aid in tracing the commencement and progress of this or other diseases." Cholera, however, appeared in Durbhunga, at a festival held at Bazitpur, in March, and in April deaths from the disease were reported from every circle in the district; the circles which suffered most severely were Madhobani, at the northern extremity of the district, and Bazitpur, on its southern boundary. In Chumparun district cholera was prevalent from May to October inclusive; only 1 death was reported in April, and none in the other months. Total deaths, 521, and villages affected, 60, out of 2299 in the district. In Sarun district, considering the density of the population and the general prevalence of cholera in Bengal, the suffering was not much in 1875; a total of 832 deaths, or 0.40 per mille of population, was reported, and 241 out of 4350 villages were affected.

Each of the four districts of the Chota Nagpore division reported cholera during the year. In Hazaribagh and Lohardugga the season of prevalence corresponded with that in the Patna group of districts, the greatest mortality occurring in June and July, with an almost total absence of the disease in the cold months. In Singbhum and Manbhum, on the other hand, although cholera did not prevail with severity, there was a more even distribution of the disease over the whole year. In Manbhum the greatest mortality was reached in March and April, in Singbhum in June and July, with a decided increase again in November and December.

In the districts of Burdwan, Bankura, Beerbhum, Serampore, and Howrah, none of which, with the exception of Howrah, suffered severely, there is more variation in the seasons of greatest prevalence, though in all of them cholera manifests the tendency to increase at two periods in the year. Howrah district returned a death-rate of 2.58 per mille of its population, and more than one-fourth of the total deaths occurred in the municipality of Howrah.

In the suburbs of Calcutta, in a little more than one quarter of a million of inhabitants, 2099 deaths from cholera were reported in 1875. The disease was not confined to one locality more than another, and was present in a

marked degree in every month. March, April, and December were the months of greatest intensity. Regarding the port of Calcutta, reference is made to some valuable notes on cholera recorded by Dr. French, "the result of his observations and inquiries during the last four months of the year, for which period he held the appointment of health officer of the port." From these notes it is gathered that there appears to be no particular locality in the port affected more than another. There were altogether 34 cases of cholera on twenty ships. No case occurred in vessels between their arrival at the mouth of the river and their moorings in port. Nearly all the cases occurred after the vessels had been some time in port. Of the 34 cases, 1 was a captain's wife, 7 were officers, 9 petty officers, and only 17 were seamen. Twelve of the 34 cases were living on board their ships in the Union Dock; 7 of the remainder had never landed. Three or four of the cases occurred shortly after the men returned to their ship, but in each the man had been drinking.

Of the 12 cases which occurred on the ship in the Union Dock a detailed account is given. The main facts recorded are as follows:—

The ship *Marguerite* arrived in port on the 16th September with a crew of 16 men, who had all been well on the voyage. On the 1st October she went into the Union Dock for repair, and shortly after increased her crew to 24 by taking 8 men from the discharged crew of a vessel lying near her in the dock. The *Marguerite* was stripped of everything in her hold, and about 300 men were daily employed upon her. The crew remained in the ship, had their meals on board, and used their supply of Bourbon water. Up to the 5th November no case of cholera had occurred among any of the workmen or officials in the dock. From the 5th to the 14th November inclusive there were 12 cases among the crew of 24 men, and 7 of them proved fatal. About 60 men of the yard slept on the premises and on the ships, of which there were two others besides the *Marguerite* in the dock, and about 700 men were employed in the workshops daily. The crew of the *Marguerite* mixed freely with the workmen, but they slept apart, had their food on board, and used their own water-supply. The condition of the dock was clean, and the ship was empty and free from disagreeable odours. The house for the crew was on deck, and in a fairly satisfactory state. Such are the facts recorded. Then comes a story of the captain's, that the men slept in the open air under a tree near the river-bank; that they went freely into the bazar and bought what they liked; that they had got hold of a cask of condemned salt meat, and had eaten freely of it, shortly after which sickness broke out among them. The men, it appears, were not stinted in fresh meat and vegetables, nor in their dram of brandy three times a day. Their water-supply, however, was changed. On the 27th October the ship's water "was purchased from boatmen who pretend to supply the Calcutta filtered water to all ships in the harbour not near enough to take a direct supply from the hydrants on the banks," and was used by the crew of the *Marguerite* from the 28th only. This water had a foul odour, as of sulphuretted hydrogen, and a very unpleasant taste, both of which were attributed to the wood of the casks. An analysis of this water showed that it was most impure and quite unfit for drinking, and on the 14th the water was thrown away, and the remainder of the crew, now reduced to 12, were removed to the Sailors' Home. No case of cholera occurred after this.

1876.—During the year 1876 several changes were made which affected the number, population, areas, and statistics of the general and selected circles of the province. By these the population of the "selected areas" was raised to 6,880,529. The statement furnished with the history of the year 1874, though applicable to the following year, does not therefore apply to the statistics of 1876.

During the year 1876 cholera was present in the province during every month, and prevailed with more or less intensity in every district. Out of the 666 circles into which the province is divided, the disease was epidemic in 154, very severe in 178, mildly prevalent in 315, and entirely absent from only 19; and 27,242 villages of the 188,805 in the province were affected by it. The total of cholera deaths registered in the "selected areas" is 23,055,

or at the rate of 3.35 per mille of the population to which the figures refer. Of these deaths, 11,066, or 5.52 per mille of population, were returned from the urban circles, and 11,989, or 2.45 per mille, from the rural circles. Inclusive of these deaths, the total mortality registered from cholera in 1876 in the entire province amounts to 196,590, or 3.27 per mille of population, and 19.99 per cent. of the total mortality of the year, against 108,262, or 1.80 per mille of population, in 1875; the excess being 88,328, or 1.47 per mille. The figures are considerably the highest of any year since the introduction of registration in 1869, and show a very great increase in the mortality registered from cholera in 1876 as compared with the returns for the preceding year. Part of this excess is due to improved registration, but most of it is attributable to an actual increase in the activity of cholera in 1876 over that of 1875, especially in the cyclone-stricken areas. The districts in which the highest mortality was registered, as compared with the preceding year, are shown in the subjoined statement :—

Statement giving the Rates of Death per Mille of Population.

Districts.	1876.	1875.	Districts.	1876.	1875.
Noakholli	20·34	2·93	Lohardugga	3·14	1·18
Darjiling	18·30	1·58	Patna	3·02	1·32
Balasore	9·55	5·60	Murshidabad	3·00	0·53
Furridpore	9·32	2·17	Gya	2·82	1·79
Backergunge	8·91	1·60	24-Pergunnahs	2·79	3·64
Chittagong	8·91	0·54	Julpaiguri	2·61	3·22
Jessore	7·14	3·60	Hooghli	2·54	1·01
Dacca	6·06	3·57	Tipperah	2·45	1·44
Poori	5·75	2·47	Burdwan	2·36	1·04
Shahabad	3·83	0·78	Howrah	2·32	2·58
Nuddea	3·51	5·48	Mymensingh	2·30	1·86
Cuttack	3·37	2·74	Rajshahye	2·07	0·95
Pubna	3·24	1·77			

The seasonal prevalence and fatality of cholera in the four grand divisions into which the province is divided — Bengal, Behar, Orissa, and Chota Nagpore—as well as in the province as a whole, are exhibited in the following series of statements, which give also the rate of mortality per mille of population and the rainfall for each month of the year :—

Cholera in the Bengal Province in 1876.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Deaths	7,431	4,861	14,998	30,642	22,790	17,620	14,233	6,700	2,470	3,735	24,556	46,554
Ratio	·12	·08	·25	·51	·38	·29	·23	·11	·04	·06	·40	·77
Rainfall	·20	·18	1·33	1·62	5·20	11·87	14·91	14·50	10·22	4·79	·75	·96

Note.—The rainfall is in inches and cents.

Cholera in Bengal Proper, 1876.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Deaths .	6,799	4,260	12,749	25,380	9,861	4,284	2,303	1,007	433	2,886	22,922	45,634
Ratio. .	·20	·12	·37	·75	·29	·12	·06	·02	·01	·08	·67	1·35
Rainfall.	·32	·64	1·94	2·09	7·86	18·36	21·94	15·18	12·13	5·26	2·12	·68

Cholera in Behar, 1876.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Deaths .	45	78	1,127	3,922	9,062	7,546	6,504	3,065	975	492	625	434
Ratio. .	·002	·003	·05	·19	·45	·38	·32	·15	·04	·02	·03	·02
Rainfall.	·22	·24	·13	1·23	1·55	7·13	8·89	14·74	9·33	4·69	·17	...

Cholera in Orissa, 1876.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Deaths .	569	490	946	959	3,070	4,402	3,588	710	345	274	1,001	479
Ratio. .	·18	·16	·31	·31	1·01	1·45	1·18	·23	·11	·09	·32	·15
Rainfall.	...	·50	1·20	1·26	2·31	4·29	13·35	12·60	11·35	8·43	·15	...

Cholera in Chota Nagpore, 1876.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Deaths .	18	33	176	381	797	1,388	1,838	1,918	717	83	8	7
Ratio. .	·005	·009	·05	·11	·23	·40	·53	·56	·21	·02	·002	·002
Rainfall.	...	...	·24	·45	1·44	8·80	16·44	15·29	6·76	5·83	...	...

The high mortality reached in November and December this year in the Bengal division is not usual, and is attributed to the effects of the cyclone in Eastern Bengal. These statistical statements show that in Bengal and Orissa—consisting of flat, low-lying, muddy plains, the former intersected by the lower course of the Ganges and Brahmaputra, and the latter by the Mahanadi—there are two periods in which cholera prevails with greater seve-

rity, viz., from March to May in Bengal, and March to July in Orissa, during which it attains maximum intensity, and again from October to December in both Bengal and Orissa, when it prevails with diminished severity; and that the remaining months are months of the subsidence of the disease after each period of its seasonal activity. That in Behar and Chota Nagpore, both of which are comparatively high and dry, there is only one period of intense prevalence of cholera, viz., from March to July in Behar, and March to August in Chota Nagpore; and that during the remaining months the prevalence of the disease is comparatively mild. That, as a general rule, the disease prevails least when the rainfall is heaviest, and has submerged, or is moving on through the country, particularly in Bengal (para. 50, p. 17, of the Report of the Sanitary Commissioner for Bengal for 1876, by Dr. J. M. Coates). In the next paragraph to that above quoted Dr. Coates writes—

"Whether cholera has a special poison of its own has not yet been demonstrated. If there be one, it is not communicable ordinarily from the living subject; first, because inoculation with fresh cholera secretions or excretions does not induce it; second, because those who rub cholera patients' skins, wash their clothes, scrape up, clean, carry, and bury their excreta, or dissect, carry, and bury the cholera corpses, do not get it; and, lastly, cholera-collapsed mothers do not communicate the disease to their sucking infants, though the latter pull at their breasts, lie on their sweat-covered arms, and on their soiled clothes and bedding. That cholera evacuations, whether in clothes, soil, water, food, &c., do become virulent, and so, especially when taken into the system by the mouth, give rise to cholera, I have no manner of doubt; but I am equally satisfied that cholera constantly arises *de novo*, and that in both cases the disease is intimately connected with the changes that occur in decaying organic matters. The most ready entrance of the disease into the system is by water impregnated with decaying organic matters. This water soon loses this power when the decaying changes are completed, and reacquires it when fresh decaying matters find their way into it. I do not know of any of the phenomena associated with the origin and spread of the seasonal and local prevalence of, and the persons affected with, the disease with which the above conditions are not connected."

In the subjoined tabular statement is shown the total mortality from cholera registered in 1876 in each district of the province, together with the ratio per mille of population and the number of villages attacked :—

Districts.	Deaths.	Ratio.	Villages		Districts.	Deaths.	Ratio.	Villages	
			In the District.	Affected.				In the District.	Affected.
Burdwan . .	4,808	2·36	5,181	572	Mymensingh	5,420	2·30	7,597	915
Bankura . .	964	1·81	2,171	238	Tipperah .	3,488	2·45	6,289	926
Beerbhum . .	1,322	1·89	2,846	202	Chittagong	9,300	8·91	985	606
Midnapore . .	1,673	0·65	13,394	478	Noakholli .	18,568	20·34	2,542	733
Hooghli . . .	921	2·54	954	119	Patna . .	4,720	3·02	5,712	1,211
Serampore . .	491	1·24	901	91	Gya . . .	5,514	2·82	6,255	1,385
Howrah . . .	1,701	2·32	1,516	198	Shahabad .	6,619	3·33	5,112	777
24-Pergunnahs	8,565	3·87	5,509	1,132	Mozufferpore	2,256	1·03	4,129	329
Nuddea . . .	6,356	3·51	3,697	312	Durbhunga	1,273	0·57	3,213	199
Jessore . . .	14,822	7·14	5,083	2,308	Sarun . .	2,557	1·23	4,350	566
Murshidabad .	4,063	3·00	4,001	945	Chumparun	2,072	1·43	2,299	290
Dinagepore .	1,121	0·74	7,108	162	Monghyr .	2,356	1·29	2,910	439
Maldah . . .	874	1·29	2,383	208	Bhagulpore	2,096	1·14	2,739	348
Rajshahye . .	2,720	2·07	4,453	588	Purneah .	2,597	1·51	4,711	209
Rungpore . .	2,093	0·97	4,154	236	Sonthal . .	1,815	1·44	9,615	288
Bogra . . .	381	0·55	3,979	106	Cuttack . .	5,044	3·37	7,006	1,274
Pubna . . .	3,937	3·24	3,422	653	Poori . .	4,428	5·75	3,176	685
Darjiling . .	1,734	18·30	...	...	Balasore .	7,361	9·55	4,991	1,416
Julpaiguri . .	1,095	2·61	465	96	Hazaribagh	1,438	1·86	6,704	255
Dacca . . .	11,257	6·06	5,048	2,053	Lohardugga	3,885	3·14	6,486	431
Furridpore . .	14,135	9·32	3,332	1,663	Singbhum .	143	0·35	3,080	62
Backergunge .	16,709	8·91	2,863	1,167	Manbhum .	1,898	1·90	6,363	289

Note.—In the Darjiling district there are no regular villages.

The cholera mortality registered in the Burdwan district in 1876 was more than double the average of that of the three preceding years. The disease was present throughout the year, and prevailed with greater severity from March to June, and again, but with less intensity, in November and December. It was continued into 1876 from an outbreak in the Katwah subdivision in November 1875, and spread through the district as the dry season advanced, but disappeared almost entirely as soon as the rains set in. "On the 10th October a considerable inundation took place from the Damudah, such as had not been known for ten or twelve years." A great portion of the country continued flooded for nearly three months. "There had been heavy rain for two or three days. This was followed by a period of great freedom from cholera, and no doubt diminished the virulence of the winter outbreak."

In the Bankura district cholera first appeared in the town of Bankura on the 1st March, during which month and the half of April it prevailed with unusual severity, and caused the heavy mortality of 7.74 per 1000 of population. "Numbers went away from the town, business was practically at a standstill, and the courts were closed for some days." The disease then spread to circles on the north and the south.

In the Midnapore district the cholera which prevailed in November and December 1875 continued to extend up to July 1876. After this month its virulence abated markedly until November, when it broke out afresh, but in less severe form. February and April were months of severe suffering.

In Howrah district the cholera of 1876 was, on the whole, somewhat less fatal than in 1875. The disease prevailed more severely during the changes of the season, from hot to cold and from cold to hot, than at other times, and diminished in intensity when the rains set in. "In character it was transient and erratic, visiting a village, disappearing from it, and going to another before medical aid could reach it." Dr. Bird, the civil surgeon, remarks—"It is noteworthy that the disease has during the past hot months proved most deadly in Howrah, where sanitary improvements are being speedily pushed on."

In the 24-Pergunnahs the cholera, which visited the district with epidemic intensity in the winter of the preceding year, continued to prevail with varying degrees of severity up to May 1876, and resumed its winter character in November and December, leaving the months of June to October markedly free from the disease. January, April, and December were the worst months; but in the greatest portion of the district the disease prevailed with less intensity and fatality than in the preceding year. "It is said that when the cold weather commences and the wind changes to a northerly direction, very dry and chilly at night, cholera appears here. At this time the poorer classes tap their date-trees, and make use of the juice with newly-reaped rice and half-boiled goor. This, it is said, causes bowel irritations and predisposes the sufferers to cholera."

The Nuddea district, it is recorded, is, as a rule, afflicted with two distinct epidemic outbreaks of cholera, the first beginning in March, especially after the storms, when the days are hot and the nights chilly, and lasting with more or less intensity till the rains have fairly set in, when it disappears; the second beginning with the dry north winds and chilly, foggy nights of October and November, and continuing to prevail with more or less severity till the end of December. If the cold weather is mild and evaporation is slow, the disease extends into the January following; and to this rule the year 1876 was no exception, although cholera prevailed much less severely

and fatally than in 1875; for the cold weather of 1875–76 being particularly mild and of short duration, the winter epidemic of 1875 continued to prevail during the first half of January 1876 in 17 out of the 31 circles of the district; the summer epidemic commenced in the first week of March, was at its highest in April, began to subside in May, and was very low in June; the winter epidemic of 1876 commenced in the third week of October, reached its height in the second week of December, and then rapidly declined to the close of the year.

The Jessore district suffered very severely from the cholera of 1876—the subdivisions of Magura, Bagirhat, and Khalna mostly so. Bagirhat, in the south-east, close to the Sunderbunds, had been submerged by the cyclone inundation of the 31st October, and the bodies of many human beings and cattle which had been drowned were left by the receding waves in the rivers, tanks, fields, and ditches, and generally polluted the water. In Khalna, in the south-east, and Magura, in the north-east, a very fatal diarrhœa also prevailed; in the latter the disease was attended with vomiting, and long round worms were voided in the purging. The disease was attributed to the use of raw fruits and vegetables and decomposed fish infested with worms.

In the Murshidabad district the epidemic which prevailed in December 1875 passed on into 1876, and prevailed with greater severity than in the preceding year. From January the disease commenced to decline, but it broke out with fresh epidemic intensity in March, and in this month and April was severest in character. From May it declined till September, when it again began to increase, and prevailed epidemically from October to December with almost equal severity as the outbreak in March. The disease followed no regular course, but broke out almost simultaneously in most of the circles.

In Dinagepore cholera was present throughout the year, though it prevailed with somewhat less severity than in the preceding year. April, May, and December were the months of greatest prevalence. In the remaining months the disease was in sporadic form, and was present in several places far distant from one another at one and the same time.

In Maldah the cholera of November and December 1875 continued to prevail through January and February, gradually extending. In March it covered a wider area, and in April, May, and June became quite general, no circle being free from its presence. From July to October there was a great lull, but in the latter part of October the disease revived, and prevailed throughout November and December; it was nowhere epidemic or confined to one locality. The medical officer is of opinion that, "although sanitary improvements are essential to prevent the outbreak and spread of epidemic diseases, they do not hold good always with cholera," and says that he has observed "that places well sanitated frequently suffer from cholera, at times vehemently." He instances the case of English Bazar or Makhdumpur, two principal quarters in the English Bazar Municipality. "The former, which was more crowded, ill-ventilated, and untidy than the latter, was free from cholera, while there were several cases in the latter."

In Rajshahye cholera was spread pretty evenly over the whole district in January; in February there was the usual characteristic lull; from March to May it prevailed with epidemic intensity; June to September was a period comparatively free from the disease; in October it broke out afresh, and continued to prevail up to the end of the year. The severity of the disease was greater in 1876 than in the preceding year. The summer epidemic raged severely in most of the northern circles lying on the banks of the Ganges, and advanced in the face of the westerly and south-westerly winds. In the

Charghat and Lalpur circles hardly a village escaped. The disease reached its climax between the 14th and 16th April, and when it commenced abating after May it did so rapidly. The civil surgeon writes—

"It was surprising to find that this outbreak, so sudden and of so vigorous a character, should have subsided so quickly, and without spreading itself over a larger tract of country. Indeed, its localisation to a small tract of land lying on the north bank of the Ganges, and forming a portion of the southern parts of our district, was remarkable, and can only be explained on the supposition that the atmospheric condition which gives vitality to the cholera germs was suddenly changed, either chemically or otherwise, and the progress of the disease thereby cut short by the frequent falls of rain that occurred two or three weeks after the onset of the epidemic, the excessive temperature being thereby diminished, as also the great diurnal range."—(From Dr. Bensley's Report.)

The winter epidemic was not so severe as the summer one, and was confined chiefly to the Nathor and Baragora circles.

In Rungpore the cholera of 1876 was a continuation "of the terrible epidemic which devastated many villages in 1875." The disease subsided considerably in February, began to be active in March, continued until the middle of September, was almost absent in October, broke out afresh in November, and increased again in December. It was most fatal in July and August. The disease here prevailed with less intensity in 1876 than in 1875. "It is stated that in those portions of the district which are dry and well drained cholera generally prevails after 'accidental introduction,' but that it loves to dwell, and has its seasonal activity, in the damp and low portions of the country."

In the Bogra and Pubna districts the cholera of 1876 was a continuation of the epidemic of the preceding year. In the former district the disease prevailed in a mild form till May, and then disappeared; but in November it again broke out, and was most severe in December. On the whole, the disease was much less severe and fatal than in 1875. In the latter district the disease affected all its ten circles, and was more fatal than in the preceding year. It was severe in January, declined in February, increased in March, and attained its maximum intensity in April; in July it declined again sensibly, and continued very low till October, that month and September being months of considerable immunity; in November the disease resumed its virulent character, and continued to rage with violence to the close of the year.

The Darjiling district, excluding the cyclone-affected areas, suffered from cholera in 1876 in a far greater degree than any of the other districts of the province. The disease, it appears, has never been absent from the Terai of late years, although it has largely escaped notice except when epidemic. The cholera of 1876 in this district was a continuation of that which prevailed in the preceding year, and assumed still greater intensity. Diarrhœa, also, and dysentery were very prevalent and fatal this year. In January, February, and March cholera was prevalent in the tea plantations at the foot of the hills, and in April extended to Karseong and the vicinity of Darjiling; all this time the disease was prevailing severely in the Terai, which it never left till the cessation of the epidemic generally. In May there was a decided and general increase of cholera, and in June the disease attained its maximum intensity and most fatal type, spreading all over the whole district, but lessening in the plains and increasing in the hills. Of the 910 deaths registered in June, 509 occurred in Karseong, 199 in Darjiling, 82 in Kalimpong, and the remainder in the Terai. It is recorded that in the civil station of Darjiling the first cases occurred on the 11th June.

"But the disease never got much hold on this sanitarium, the few cases that occurred being of a sporadic character, and only eleven of them proved fatal. With the heavy rains of July a great and general improvement took place, and early in August the disease quite disappeared. The mortuary returns show that 1734 deaths occurred during this outbreak, but Dr. Purves is of opinion that only about half the actual mortality was recorded."

On the subject of the diet of the working classes Dr. Purves says—

"If no better present itself the veriest carrion is devoured, and human beings, birds, and beasts have been seen fighting over the same carcass. . . . They seldom miss a chance of gorging themselves with food, putrid or otherwise, and probably follow this up by getting drunk and lying out all night in the cold and damp."

Regarding the cholera in the tea plantations, it is stated—

"The immunity of the Europeans living in the midst of this epidemic was remarkable, although they attended the sick and buried the dead. This Dr. Purves ascribes to good accommodation, suitable food, good drinking water and clothing, and attention to the general laws of sanitation."

With regard to the conditions of life of the poorer classes, who "live on coarse, deficient, and innutritious food," Dr. Purves noticed that—

"The habitations of the labouring classes, particularly of the coolies in the gardens, were crowded together; that too many lived in one house; that the houses were surrounded with filth; that conservancy in the coolie lines was limited, the refuse and filth being left undisturbed; that the discharges of those who were attacked by cholera were allowed to saturate the floor of the houses, or were thrown outside near the huts."

In Julpaiguri district cholera was present in a mild form during the first three months of 1876. In April it gradually assumed an epidemic form over an extensive area, in May it prevailed very severely, and in June reached its maximum intensity in extent and fatality. In August it declined, and from September to December there was great immunity from the disease. Altogether the disease was less severe in 1876 than in 1875. It is stated that movement from an affected locality invariably checked, if it did not entirely put a stop to, the "spread of the disease," and that the poorly fed suffered the most.

In Dacca district the cholera mortality of 1876 was nearly double that of 1875. The outbreak of the disease in October 1875 continued to rage almost all over the district up to the end of January 1876. In February it declined to a great extent, but in March and April its virulence increased, and it continued to prevail epidemically until the middle of May. It was less prevalent from June to September, but prevailed again in October, and lasted up to the close of the year, November and December being months of great suffering. The whole district suffered, and the mortality in its fifteen circles of registration was very severe. The civil surgeon believes that the lesser prevalence of the disease during the months from June to September than at other times of the year was due to the inundation which took place in the southern and part of the northern portions of the district during this period.

In Furridpore district 1876 was a year of unusually excessive prevalence of cholera, and also of great fatality, the death-rate having risen from 2.17 to 9.32 per mille of population. Here, also, the cold-weather outbreak of 1875 continued on to January of this year. In February the disease declined, but in March and April it prevailed epidemically. From May it commenced to decline, and continued to do so rapidly up to September. From June to September the district was almost free from the disease, which is usually the case in those parts which are subject to fresh-water inundation of the

River Padda, which kept the country under water till September. This immunity is also due to the heavy rains of this season. In October the disease again became epidemic, and continued so up to the end of the year. The circles in the north of the district, on comparatively elevated alluvial soil, earlier formations of the River Padda, suffered more in the earlier than in the later epidemic. The circles in the central and southern portions of the district are comparatively low, and suffered most in the cold-weather epidemic; in these low tracts are extensive swamps with an abundant growth of vegetation, which commences to rot in the cold weather, after the subsidence of the inundation water. Of the two circles on the alluvial formations situated between the two large divisions of the Ganges in this district, viz., the Padda and the Arealkhan, that of Sadarpur suffered most in the cold-weather epidemic, and that of Palong almost equally during both epidemics. Every circle in this district was very severely attacked, and in all of them the mortality was very high. "The cyclone touched a small portion of the south-east portion of this district, and very partially flooded this part of the country; the water was fresh and of little depth; dead animals did not fill the tanks and streams, and cholera did not ensue."

In the Backergunge district cholera is always present to a great extent. The extension of the disease from the close of 1875 to the commencement of 1876, and the March to May and October to December prevalence of the disease, with the interval of subsidence from June to September, obtained also in this district. It has been observed that in this district the increase or decrease of cholera, whether the disease prevails epidemically or endemically, is greatly influenced by the fall and rise of the rivers, streams, tanks, swamps, &c., all over the district with the seasons of the year. When the water of the river is evaporating in September, and again after the storms of March, the disease prevails in the highest degree. When the rains have well set in and the earth is saturated, and the storm-water is flowing freely, it prevails in the least degree.

"Backergunge is a flat alluvial country; the highest parts are the banks of the rivers, and the lowest levels are those between the large rivers. The whole district is intersected by numerous rivers, having a southerly direction, with numerous connecting channels between them. Cholera first attacks those parts of the country which are affected by the fall in the height of the water-level after the cessation of the rains, and these are the highest parts of the country near the banks of the large rivers. In its spread it follows the fall of the country and the retreating water. The circumstances attending several local outbreaks that took place during the year in the district bear out the above observations. The tanks, which are very numerous in each village, have their banks usually covered with trees, dead leaves fall into the water, and all sorts of refuse are cast in, and fill the hollows and slopes leading to them."

It is recorded, also, that the winter prevalence of the disease took place in this district, as usual, in October, with a mortality rising from 37 deaths in September to 399 in October, against 94 and 490 respectively in the corresponding months of the preceding year.

"These facts indicate that, independently of the action of the cyclone and storm-wave which visited the east of this district, and greatly aggravated the severity of the disease, the winter epidemic prevalence of the malady had been called forth by the other conditions capable themselves of bringing it into activity."

On the night of the 31st October 1876 a severe cyclone, accompanied about midnight by storm-waves rising to a height variously estimated at from 10 to 20 feet, and in some places higher, occurred in the Bay of Bengal, and burst over principally this, the Noakholli, and the Chittagong districts. The storm-waves affected this district as far as Ferozepur, but especially

the eastern portion—the islands in the Dakhan Shahbazpur subdivision, in the estuary of the Megna and the Ganges.

"Besides causing an immense loss to life and property, this calamity greatly increased the ordinary insanitary conditions of the affected localities. The dead bodies of men and animals were left exposed on the fields all over the country. Swarms of flies were generated in the decomposing carcasses; the stench was unbearable; vultures and jackals would not touch them. Although the water of the storm-waves was fresh, the tanks were in many cases polluted by the dead bodies; and in all cases they were filled by the straw, thatch, branches of trees, and other debris, the foul contents of hollows, &c., swept on by the waves. The people were houseless, or imperfectly sheltered under temporary sheds. They were living on damaged new rice. They were so awed and paralysed by the sudden devastation and the many deaths, that they neither burnt nor buried the dead, rebuilt their huts, nor cleared their tanks, notwithstanding that every means short of force was used by the local authorities to induce them to do so."

Very little cholera, however, it is stated, occurred in the wave-stricken tracts before the middle of December, "and the disease was neither so severe nor general here as in Noakholli and Chittagong, and the islands near them, which were surrounded by salt water." But when the cholera did break out it was of the most fatal nature, and was followed on its decline by diarrhœa, dysentery, and dyspepsia. Cholera broke out early in December, with a tendency to become epidemic, in the extreme north of the Dakhan Shahbazpur subdivision. By the beginning of January the disease travelled southwards, and appeared in a most virulent form throughout this subdivision during the first ten days of the month.

"It began to abate soon after manifesting this severity in the northern half of the subdivision; some showers at the end of January caused it greatly and generally to decrease, and it disappeared entirely and immediately after the copious rainfall that occurred early in February."

Under the circumstances reliable information of the casualties that occurred could not be obtained; 8000 deaths were, however, estimated to have occurred in this subdivision during this period. In the three circles of the Patnakhali subdivision the disease was severe and fatal from the end of December to the end of January.

"The rainfall towards the end of this month checked the disease here also, and the very heavy rainfall in the first week of February caused it suddenly to cease *in toto*."

The estimated deaths from this cause were 4450. A small portion of the Backergunge circle—Darial—was also visited by this epidemic; estimated deaths, 300.

The Mymensingh district, in common with the other districts in Eastern Bengal, has its periods of endemic prevalence of cholera from November until the occurrence of the periodical storms in March, of increasing violence from March to May, and again from October to December, and of subsidence from June to September. "The cholera of January 1876 was a continuation of that of the preceding year. During February and March the disease had subsided considerably, but in April it became severe, and culminated in severity in May; after which it subsided till November, when it reassumed its severe character. The district was comparatively free from the disease during June to October." The east and south-east portion of the district, in which are extensive swamps bordering on the Megna, suffered most severely. In the rains this part of the country is a vast sheet of water. In the west the disease was very prevalent up to the middle of December, especially along the Jabuna. The northern half of the district was free from cholera in the November and December outbreak, while the disease prevailed freely

in the southern half; in the earlier outbreak of this year, as well as in other years, the northern half did not escape.

In Tipperah district the same periods of prevalence and subsidence of cholera occurred as in the other districts of Eastern Bengal. The disease broke out soon after the inundation in August 1875, and prevailed severely up to the end of May 1876. From June to September it subsided, and then reappearing, continued to the end of the year. It followed no particular course, but occurred in different parts of the district simultaneously. The whole of the west face of the district, which borders on the Megna, and is intersected by streams and watercourses, is much more liable annually to epidemic cholera than the eastern half, which is bordered by the Tipperah Hills, and in which there are comparatively fewer streams and watercourses. The drying up of the heavy floods of August 1875 was followed by excessive drought.

In the Chittagong district two epidemics of cholera occurred in 1876. The first, beginning at the close of the unusually severe rainy season of 1875, and ending practically with the rains of 1876, prevailed pretty widely over the district. The other, the most disastrous of any on record, followed in the train of the cyclone inundation which burst upon this district on the night of the 31st October. The rains, which were unprecedentedly excessive during June and July 1875, culminated during the first week of August in a serious inundation, which deluged the half of the north-east of the district. This was followed by a season of unusual dryness, and the soil, which during the rains became over-saturated, now became abnormally dried up by the sinking of the subsoil water.

"Moreover, the rays of the sun, acting upon the inundated ground, caused the evaporation of malaria, and so the general unhealthiness, caused by the other factors, such as bad food, unsuitable dwellings, bad or absence of all conservancy, was increased."

A notable fact mentioned by the Magistrate is—

"That the Maghs down Coxe's Bazar, who eat putrid fish habitually, and whose houses are raised on piles, and all the offices of nature performed through the floor, and the ground beneath never cleaned for generations, *had no cholera.*"

The second epidemic broke out suddenly in November, almost immediately after the cyclone and storm-wave which swept over the eastern portion of this district on the 1st of that month, extending inland from three to six miles along the coast. The deaths in November were 2101, and in December 5261. The high military road from Dacca to Chittagong was the inland boundary of the wave in the north of this district; the inundation lasted only a few hours. Cholera was severest and soonest in incidence in the north, later and less intense in the south, which was farthest from the centre of the cyclone; for the inundation came from the west and south-west, gathering force and volume as it passed to the east. The whole district was affected, Coxe's Bazar excepted.

"Where the storm-wave did not encroach there was comparatively little cholera. Europeans, who are careful about sanitary arrangements, and who, in the Sadr station, live upon the hills and elevated dry ground, suffered little. Besides prevailing extensively, this epidemic was very fatal. Out of 8464 persons specially reported by the police to have been attacked in November and December, 7362, or nearly 87 per cent., were said to have died."

In the Noakholli district cholera, as regards its endemic prevalence, epidemic intensity, and seasonal subsidence, does not differ from that of the other districts in Eastern Bengal. The summer prevalence of the disease in 1876 was not generally severe or epidemic in character, but during April

and May it was prevalent in every circle, and those parts of the district which are nearer the large rivers, particularly to the south and south-east, suffered most. Dr. Lyons, the civil surgeon, writes—

"Both the disease and its cause are never absent, being aggravated by atmospheric and other conditions which are not yet sufficiently understood. One of the conditions I have noticed lately, and wish to convey, is that a very perceptible heat is felt from the earth upwards for several feet, accompanied in parts by unpleasant smells, noticeable along the roads and over ground apparently dry and well formed. These are forced on the attention only in such places where the sun is acting powerfully, so that when it rains heaviest and the country is under water the active causes, whatever they may be, are kept in check."

He adds that not any of the Europeans, Native officials, or other well-to-do people suffered from the disease, notwithstanding that the epidemic raged with extreme severity in Sadharam. The inundation caused by the cyclone, and which was partly, if not entirely, of salt water, involved the whole of the southern portion of the district, and affected all its registering circles except those of Ramganj and Begumganj. Early in November—the 3d or 4th—cholera broke out epidemically throughout the inundated tracts, and caused very severe mortality, the deaths in these tracts in November and December being no less than 16,125, out of a total of 18,461 deaths in the same area during the whole year.

In Patna district, as well as the other districts of the western division of Behar, the character of cholera differs in point of seasonal prevalence from that of the disease in the districts of Lower Bengal. In the Western Behar districts there is no second or winter epidemic, nor continued prevalence of cholera from the close of one year to the opening of the next, both the earlier and the later months of the year being markedly free from the disease, the period of maximum intensity being from April to June. In 1876 cholera prevailed very severely and fatally in the Behar subdivision in June; in Dihri there was an outbreak among the coolies on the canal works at Barh in May, and in April the disease broke out in Dinagepore.

In Gya district cholera prevailed throughout the year, observing the normal course of seasonal prevalence. The southern and central portions of the district were chiefly affected, and villages situated long distances apart from each other were simultaneously attacked.

In Shahabad district cholera prevailed severely from May to July inclusive, less so in August and September, and in a mildly sporadic form during the remaining months of the year. Villages which were "literally clean" suffered equally with those of which the sanitary conditions were bad. The heat was unusually great and the rainfall scanty. The coincidence of cholera prevalence with scanty rainfall "has been observed several times during previous years, particularly in 1873, when the rains were late and insufficient, and a severe epidemic of cholera prevailed."

In Mozufferpore cholera was present most severely in May and June; in the other months presenting very few cases. The disease did not concentrate itself in any particular locality. The heat was above the average during May and June, and no rain fell from September to April, and scarcely any till the end of May. Many of the tanks and wells dried up, and many of the wells had only 18 inches of water in them, and the river was nearly dry. When the rains set in in July the disease ceased.

In Dharbanga cholera "first made its appearance in March, in the eastern and southern outskirts of the district. It then spread to the northern and western boundaries, and having encircled the district, proceeded centrically

in a gradual and uniform manner, reaching the Sadr station some two months after its first appearance. It was present for a whole month in the Sadr station, after which it suddenly disappeared both from it and the eastern districts. A day or two prior to its disappearance from the Sadr station a severe thunderstorm occurred, remarkable for a copious liberation of electricity and for very little rainfall—so little, indeed, that it barely sufficed to lay the dust."

In Sarun district cholera was severe from April to September, particularly so from June to August. In the other months it was very mild. "It spread in a desultory manner. Men suffered in a greater proportion than women." The civil surgeon writes—

"The exciting cause of the malady was, I believe, the atmosphere, impregnated in some instances by emanations from cholera evacuations, and by means of water polluted by cholera discharges. The predisposing causes were debility, intemperance, depression of spirits from fear of infection, insufficient food, malarious influences, damp, impure air and water. I have not been able to satisfy myself that the appearance of cholera was dependent upon any particular local or insanitary condition, either in respect to conservancy or drainage; nor does there appear to be any special reason why some places suffered more than others."

In Chumparun district the cholera of 1876, compared with the outbreaks of the preceding three years, was severer and the mortality higher. Commencing in April, the disease spread rapidly in all directions, attained maximum intensity in June, when all the circles in the district, except three in the extreme north, were more or less severely affected, and ceased in September, when only a few sporadic cases were met with here and there. In the opinion of the civil surgeon, Dr. Meadows, "the prevalence of cholera in this district seems to be dependent on climatic conditions. . . . One fact is evident, that its annual appearance may be looked for to a certainty in April or May, followed by a cessation in August, rarer later than September, and one or two years of immunity, followed by a violent outbreak."

In the Monghyr district the seasonal characteristics of cholera are the same as those of the disease in the Lower Bengal districts. In 1876 there were several sharp outbreaks in different parts of the district between March and May, and again in October; the disease was not confined to any particular locality, but was often found to be present in widely separated villages.

In Bhagulpore district the endemic cholera often assumes the epidemic form. March to August is the period of greatest prevalence, September and October are months of subsidence, and January and February, November and December, of marked immunity from the disease. In 1876 cholera was spread over the whole district, but, on the whole, the visitation was not severe. A large number of cases in the town of Bhagulpore occurred among children.

In Purneah district the seasonal course of cholera is the same as in Bhagulpore. The disease was not severe in 1876, though every circle was affected, and there were smart and fatal outbreaks among some of them.

In the Sonthal district the periods of cholera prevalence, subsidence, and immunity are the same as in the other districts of Eastern Behar, except that there is an exacerbation of the disease in November and December. In 1876 cholera first appeared in February, among the pilgrims assembled in the town of Deogarh for the Shibrath festival, and rapidly spread to the neighbouring villages, where it continued until May, March being the month of greatest prevalence. In the Godda subdivision the disease commenced in

March, and, spreading over the whole subdivision, lasted till August. During the rains the disease subsided greatly, but it reappeared after their cessation, and was very severe in November. "Village after village was attacked, but the affected villages were at a great distance from one another."

Cuttack district suffered very severely from cholera throughout 1876, but May, June, and July were the months of greatest prevalence. There was scanty rainfall and drought here in this year. "It is worthy of notice that though so many thousands of pilgrims pass through Cuttack year by year, carrying cholera with them, the European residents have never suffered from it. The Madras Regiment, too, almost invariably escapes."

In Poori a very severe and widespread epidemic of cholera occurred in 1876. It commenced in January and lasted till August. In March, June, and July, the last month particularly, it was most virulent and fatal in character. In many places far from the pilgrim routes the disease prevailed virulently.

"Notably among them are Gôp, where it was severe, and Karnalla and neighbouring villages; in Pergunnah Chowkerabad, bordering on the Chilka Lake; in the Poori circle, where it was most virulent this year, while in the previous one there was hardly any present in this locality. There was no communication between these villages and the nearest pilgrim route."

With regard to the prevalence of the disease among the pilgrims themselves—

The usual oft-repeated causes were in operation, principally fatigue and exposure during the long journeys that they undertake, errors of diet, coarse, uncooked food, polluted water, damp earth, night chills along the road, &c. "On arrival at Poori," the report continues, "the people are densely crowded, sleep outside, eat bad food, drink foul water, and their defecations pollute the soil. During the festival they are in a high state of religious excitement, and this is followed by utter mental depression; and they are also subjected to much exposure, as the festival takes place in the beginning of the rains (June), when the pilgrims have to walk about in the wet and lie on the damp ground."

The ascertained number of pilgrims who died in the Poori circle in 1876 was 508; of this number 274 succumbed to cholera, and the rest to other diseases, principally bowel complaints. Of the cholera deaths, 204 occurred in June and July, when the Car festival took place. A high temperature, with minimum rainfall, is mentioned as the great concomitant of the severer prevalence of the disease this year as compared with the preceding year. The temperature during the first seven months of 1876 was much higher than it was during the corresponding period of 1875, while the rainfall was much less, the mean temperature for this period in the former year being 81.18° against 80.07° in the latter, and the total rainfall 11.38 against 29.78 inches.

"It is remarkable that the Europeans living in Poori are always exempt from cholera attacks, though they are often surrounded by the disease to a great extent. The same holds good in Balasore also. The cause is as plain here as elsewhere, viz., they live comfortably."

In Balasore the cholera of 1876 was much more severe than that of 1875, and was present throughout the year. Its periods of severity were during March to August, and again in November and December; but the maximum intensity and fatality was during June to August inclusive—the pilgrim period. February, September, and October were months of great immunity. The disease first appeared in Chandbali in January, and in February spread along the coast as high up as Soroh; from February to August it was present in every circle, but was more prevalent in the south than in the north.

In Hazaribagh, as in the other districts of Chota Nagpore, the period of

intensity of cholera is from March to August, the months preceding and following this period being months of great immunity from the disease. In 1876 cholera was generally prevalent in this district, and more so than in 1875, but it was not generally severe or very fatal.

In Lohardugga the cholera of 1876 first appeared in the beginning of March, commenced to decline by the end of August, and disappeared by the end of September. In Ranchi the disease was very severe in July, and the Palamow subdivision suffered severely between May and September.

In Singbhum there was little cholera in 1876. The cases were scattered, and fourteen out of the thirty-four circles escaped the disease altogether. The disease prevailed severely in only three or four villages in the south of the district, and the mortality generally was less than in the preceding year.

In Manbhum a few cases of cholera occurred here and there during January and February; in March the disease increased, and during May and June was generally prevalent, every circle being affected except that of Barabhum, which remained exempt throughout the year. The disease was most severe in the months of June, May, July, and April, in the order of their mention; in August it began to decline, and during September to December there were only a few scattered cases. Dr. Wilson, the civil surgeon, remarks—

"That four-fifths of the deaths took place in the hottest and driest months (March, April, May, and half of June), which accords with the general experience in these parts, while the remaining one-fifth of the casualties occurred in the rains (latter half of June, July, August, September, and first half of October), with the exception of fourteen deaths which happened in winter. This season of the year is inimical to cholera, as has been remarked all over the world."

The year 1876 was one of abundant and fairly distributed rainfall. The quantity measured was 66.74 inches (average of the year for the province), or nearly 5 inches more than the fall of the preceding year, and nearly $1\frac{1}{2}$ inch more than the average annual fall for the province.

The price of food in 1876 was considerably higher than in 1875; the price of rice was markedly dearer in Eastern Bengal, Tirhut, and Orissa. The highest prices for food-grains ruled in Darjiling, Chittagong, Julpaiguri, Rungpore, and Noakholli. In the greater number of districts wages continued to be the same throughout the year as compared with the preceding year, and wherever there was a change the tendency of the change was rather towards a rise than fall in wages.

1877.—In this year there was a very marked abatement of cholera prevalence as compared with the preceding year. Among the civil population the death-rate fell to 2.58 from 3.27, taking the returns for the whole province in both years. The disease was present in every month of the year, and visited every district. Of the 663 registering circles, it prevailed epidemically in 88 against 154 in the year before, was severe in 103 against 178, mildly prevalent in 410 against 315, and entirely absent from 62 against 19. The cholera of 1877, although very markedly on the decline, was nevertheless severely prevalent in particular localities; and the districts that suffered most were the following:—

District.	Ratio per Mille.	District.	Ratio per Mille.
Noakholli . . .	23·94	Dacca	4·27
Backergunge . .	9·97	Jessore	4·13
Chittagong . . .	8·33	Chumparun . . .	3·62
Poori	7·52	Mymensingh . . .	3·39
Maldah	6·50	Pubna	3·15
Nuddea . . .	4·36	Balasore . . .	3·08

The monthly prevalence of the disease is shown in Table No. II. The high range of mortality in January and February 1877 is quite unusual, and entirely due to an exceptional cause, viz., the epidemic continuance in the Backergunge, Chittagong, and Noakholli districts of the cholera developed by the great cyclone-wave inundation of October–November 1876.

In Bengal Proper the year 1877 opened with a severe prevalence of cholera in the whole of the southern portion of the central districts, in all the eastern districts, and in Beerbhum, Hooghli, and Howrah of the western districts. Within this area the disease continued to prevail until May, being markedly severe in Nuddea, Howrah, Jessore, Dacca, Furridpore, and Tipperah, and epidemic in the cyclone-stricken areas of Backergunge, Chittagong, and Noakholli. From June to August cholera prevailed very mildly, and was entirely absent from several districts in some of the months of this period. Darjiling, which was epidemically visited in 1876, enjoyed immunity from the disease almost throughout the year. The autumnal epidemic, commencing in September and continuing to the close of the year, prevailed with severity only in Howrah in the western districts, in the northern and central portions of the central districts, and in the eastern districts, with the exception of Backergunge, Chittagong, and Noakholli. The districts most severely visited by the cholera of this season were Nuddea, Jessore, Dinagepore, Pubna, Bogra, and Mymensingh.

In Behar cholera prevailed very mildly during the first three months of the year, except in Maldah (which during the year was transferred to this division), where it prevailed severely from January to May. From January to March Darbhanga and Chumparun were markedly free from cholera. As usual, however, the disease prevailed in a severe form all over Behar from April to August, or even September in some places; while in Purneah and Maldah, in Bengal, it also prevailed in the cold season. The districts which suffered most severely were Chumparun, Tirhut, Monghyr, and Bhagulpore.

In Orissa the periods of severe prevalence correspond with those of Bengal, viz., from January to May and September to December. But in 1877 the spring outbreak continued until August in Poori, and the autumn outbreak began in August in Cuttack. Cholera was epidemic in Poori during the early outbreak, and most severe in Cuttack during the winter, and in Balasore during the early visitation.

In Chota Nagpore the cholera of 1877 prevailed with marked mildness throughout the year.

The conditions associated with soil, air, water, drainage, conservancy, diet, crowding, climate, &c., &c., reported from year to year to favour the development of cholera, were again referred to this year as the exciting or predisposing causes of the disease. The following particulars are gathered from the history given of the incidence of cholera in the districts :—

In Beerbhum cholera prevailed generally from January to March, and most severely in the easterly parts of the district, in which area lie two

places of pilgrimage, viz., the Baidnath and the Ganges. After March the disease almost left the district, and out of 693 deaths only 16 occurred in the five months June to October.

In the 24-Pergunnahs, regarding the prevalence of cholera in the Baripur subdivision, it is recorded that—

"Cholera breaks out very soon after the rice crops are removed from the fields, which are then exposed to the full action of the sun. In the lower parts of the country, where the extensive rice swamps continue submerged until the end of February or March, the disease breaks out later than in the higher parts. In the cold weather a shower of rain acts as a temporary check, and in the rainy season, when the soil is saturated, vegetation rank, and the land covered with crops, cholera disappears. Those parts of the country which are subject to inundations suffer most after the subsidence of the floods. Bad living and the consumption of new rice and the fresh toddy of the date-tree have also some connection with the spread of cholera."

At the fair held during eight days in January in Sagar Island, and attended by about 50,000 people, cholera broke out, and caused fifteen deaths; at the fair held in Harwa during seven days in February, and attended also by about 50,000 people, cholera appeared, and caused four deaths. In the January fair the outbreak abated after a shower of rain.

In Murshidabad cholera raged with great violence during April and May and during October and December. "These outbreaks were not confined to particular localities, but occurred simultaneously in different parts of the district remote from each other, and in a few days spread throughout the district."

In Rungpore cholera is endemic in the district, and "generally breaks out on both banks of the Brahmaputra, attacking chiefly newly settled villages on the sandbanks of that river."

In Pubna district the winter cholera was very severe, and proved very fatal in every circle. "A rather smart outbreak, attended with severe mortality, occurred among the floating population of the boats collected for trading purposes at Serajganj. These people numbered from 20,000 to 30,000, and very little sanitary supervision was exercised over them. They were dispersed, the disease abated, and the diminution was ascribed to the dispersion. Had it suddenly developed itself all over the country, the dispersion would have been accused of doing the mischief by disseminating the germs broadcast."

In Dacca district, as in former years, the January cholera was a continuation of the autumn outbreak of the preceding year. The disease declined in February and March, but in April it increased rapidly and became very general. In May and June it gradually abated, and in July, August, and September, when most of the country was several feet under water, the greater part of the district was free from it. In October cholera broke out afresh, and prevailed in several circles with much severity. In November it spread all over the district, and continued to prevail up to the end of the year. Dr. Crombie, the civil surgeon, commenting on the fluctuations of cholera in this district, writes—

"Looking for causes which are likely to be factors in producing the yearly fluctuations of cholera, giving rise to its spontaneous, or at least to its simultaneous, outbreak in certain months, and its decline and disappearance all over it in other months, one is struck, in the first place, by the absence of epidemic cholera during the season of the annual inundation. During the months of July, August, and September, when about eight-tenths of the district is under 3 to 4 feet of water, and all the ground not submerged is soaked with constant rain, there is no cholera. Whether this may be due to the clearing of the village nullahs, . . . to the filling up of the village tanks, . . . or whether it is due to the submersion of the surface of the country from which the

cholera poison emerges at other seasons; or whether or not the occurrence of the annual flooding and the cessation of cholera all over the district are simply a coincidence, the two phenomena being independent of each other as regards causation, are questions upon which there are probably as many opinions as minds. This at least must be conceded, that on the fall of the rivers and the exposure of the surface to the sun cholera begins again to manifest itself. During October cases occur simultaneously in widely separated parts of the district, and in November there is scarcely a village of 500 inhabitants that has not its cases or deaths from cholera; and so in December. But in January, February, and March, without any flooding, there is an evident amelioration of the cholera conditions, which are again paramount everywhere in April, to lose their power in May, without any of the country coming under water. In June the rivers rise and flood the country, and cholera disappears. Should it be admitted that the annual disappearance of cholera is caused by its being drowned out by the annual flooding during the rains, it must still be allowed that there are other seasonal influences which control its causes at other seasons. Is it the subsoil water? There is a steady fall of the level of the subsoil water during the last three months of the year, during which cholera reaches its greatest prevalence. During the month of October 1877 the level of the subsoil water fell from 5 feet on the 1st to 7 feet 7½ inches on the 31st, *i.e.*, it fell 1 inch every day, and the fall was steady. In November the fall was still more rapid, being at the rate of 1⅝ inches in the first half of the month, and 2 inches daily in the second, the total fall during November being 4 feet 6 inches. In December the fall was not so rapid, but it was from 12 feet 3 inches on the 30th November to 14 feet 10 inches on the 31st December, or exactly 1 inch every day. But in January the level of the subsoil water is still falling, and the prevalence of cholera becomes greatly mitigated. In 1877 the observations at Dacca show that it fell steadily through 1 foot 5 inches during January, and the deaths in the district fell from 2700 in December 1876 to 1100 in January 1877. During February the subsoil water-level fell 28 inches, and the deaths were not 450. On the 1st March it was 18 feet from the surface of the ground, and it fell 7 inches between the 1st and 21st, and then began to rise, rising 6 inches during the remaining ten days of the month. The deaths from cholera were 400. The level of the subsoil water rose 20 inches in the first seventeen days of April, and fell 22 inches by the end of the month, and stood at 18 feet 2 inches on the 31st. There were 1300 deaths from cholera during the month. During the month of May the level fluctuated. It fell during the first week, rose 10 inches in the second week, and fell 4 inches in the third week, and remained nearly stationary till the end of the month. The deaths from cholera were 650. In June it rose rapidly during the first half of the month, and fluctuated during the second. Cholera had now nearly disappeared. On the 1st July the subsoil water was 5 feet 4 inches from the surface, and it rose to 4 feet 3 inches on the 21st, falling towards the end of the month; the country was now under water, and there was no cholera. In August the level was still rising, but in September it fell from 6 feet 2 inches on the 1st to 9 feet 4 inches on the 31st; but the country was still under water, and there was no cholera. The following statement will show what relationship, if any, existed between the level of the subsoil water and the prevalence of cholera in this district:—

Months.	Subsoil Water.	Cholera.
January	Falling steadily.	Decreasing.
February	Do.	Do.
March	Falling for three weeks, rising at end of the month.	Do.
April	Fluctuating between 18 and 20 feet from the surface.	Very prevalent everywhere.
May	Fluctuating slightly.	Disappearing, except at Rupjan.
June	First half rising rapidly, second half fluctuating.	Had almost disappeared.
July	Rising from 5 ft. 4 in. to 4 ft. 2 in. from the surface.	No cholera.
August	Still rising slightly, and fluctuating.	Do.
September	Falling steadily from 6 ft. 2 in. to 9 ft. 4 in.	Do.
October	Falling steadily.	Reappearing.
November	Do.	Raging.
December	Do.	Do.

"From March to June the level of the subsoil water is influenced by the tides, and it probably fluctuates with a good deal of freedom through the sandy soil of the district.

On this account the level is noticed to rise and fall daily, and the exact level cannot, of course, be given during these months. From October to February the influence of the tides is not felt so much, because during these months the rivers are falling, and the subsoil water, falling more slowly with them, does not feel the influence of the tides in an appreciable manner. From July to September the rivers are not tidal.

"Taking everything into consideration, it cannot be said that there is any parallelism between the fluctuation of the subsoil water-level and that of cholera in this district. With a steady sinking of the subsoil water from September to March, cholera appears in October, rages with violence in November and December, and gradually becomes quiescent during the remainder of the period. It may be said that the level of the subsoil water is too deep in January, February, and March (14 to 18 feet) for its fall to have any influence, and that it was more likely to act as a cause of cholera during the time it was falling through the upper strata saturated with decomposing matter; but in April the level of the subsoil water is practically the same as in March. It fluctuates through 2 feet 18 to 20 feet below the surface of the ground, and yet cholera bursts forth with renewed violence in almost every village community, and in May, the condition of the subsoil water remaining unchanged, cholera is disappearing. It is true that in April there are frequent heavy showers of rain, which are often capable in a porous soil of moistening the upper strata, and thus favouring decomposition in them; but there is no difference between April and May in this respect. The showers are somewhat more frequent and heavy in May. In June the subsoil water is rising rapidly, but cholera almost entirely disappears. It is therefore evident to my mind that, if the annual flooding during the rains and the rapid and steady fall of the level of the subsoil water during the last three months of the year have any influence in causing the absence of cholera in the first period, and its general prevalence during the second, there is still some other seasonal influence at work during the remainder of the year, the cholera fluctuations of which are not influenced by them. What that other seasonal influence or combination of meteorological and other conditions may be, I am not prepared to say, though I am making it a subject of special inquiry, for which I hope I have to some extent cleared the ground by the foregoing remarks."

In the Orissa districts the cholera of 1877 was very severe, but, on the whole, less so than in 1876. In Cuttack and Balasore there was a considerable decline, and in Poori a greatly increased prevalence. In Cuttack the disease was most severe in Jangalsingpur, in the south, which is off the pilgrim route; while Jajipur, Aul, Patamandi, and Kendrapara, which are on the direct line followed by pilgrims, suffered comparatively little. "Moreover, as the usual seasonal outbreaks of the year culminate in March and September, they cannot be credited wholly to pilgrims, because June and July, the months of comparative respite, are the months during which the greatest numbers are on the roads to and from Poori."

In the Poori district cholera was present in January, in places far apart from each other; but as the pilgrims flocked in the disease rapidly increased, and became epidemic about the end of February, first in Poori town, and then along the pilgrim routes in Poori, Pipli, and Khurdah circles; it also prevailed in remote places, such as Gôp, Nemapara, Bolia, Patra, and Bisnapur. In ordinary years the Rathjatra (Car festival), held in June or July, is by far more largely attended than the Doljatra (Swing festival), held in February or March; but in 1877 the latter festival was a specially holy one, said to occur only once in a hundred years, and the crowd of pilgrims who came from all parts of India to visit Jagannath was estimated at 200,000, nearly four times as many as attend in ordinary years. In March cholera was at its height, and the mortality in the town of Poori was very severe, the residents suffering more than the pilgrims. In April the disease ceased in the town, and began to abate in the district generally, but slowly. "In former years it has been observed to abate rapidly until May, to revive in June and July, when the second festival takes place, and abate again a second time by October. This year (1877) the disease did not abate till May, but then it slowly and steadily declined until October, a marked feature being

the absence of the usual epidemic during the second festival in June and July." In November and December the usual autumnal prevalence was coincident with a minor festival held in November. Of the total 5795 cholera deaths registered during the year, 3905 occurred in the months of February, March, and April, and 1230 of the number were pilgrims. The over-crowding in the town during the festival was very excessive.

"The existing lodging-houses could not furnish room for more than a small fraction of these men, and thousands of pilgrims had to pass their short stay in Poori in the open streets, gardens, under trees, &c., &c. With an area of three square miles nearly, and a resident population of 22,695 souls, the town of Poori was said to have received a temporary addition of nearly 200,000 souls during the months of February and March."

The insanitary conditions of the town, which have ordinarily been great, were very materially increased during, and some time after, this great festival. With regard to food and drink—

"The rice cooked in the temple and offered to Jagannath formed the main part of the food of this immense crowd. This food is often cooked of bad and unwholesome materials, and is made available for use at extremely irregular hours, sometimes very late in the evening. It is often sold when putrid, and consequently injurious to robust health and deadly to those in low health. The irregularities were multiplied manifold at the great festival in March 1877; hence partial starvation on the one hand, and unwholesome food on the other, no doubt predisposed the system of the pilgrims to attacks of sickness. This, combined with high religious excitement, preceded by the physical discomforts of a prolonged and wearisome journey, paved the way for any disease, especially cholera. The water-supply of Poori town has been naturally bad. The nature of the soil is porous. The human excretions were never removed, and the soil got quite saturated with ordure. During the rains these animal matters got dissolved and percolated through the soil. Wells and tanks, which form the sources of water-supply in the town, could never be expected to remain uncontaminated. Besides, the tanks are used for bathing purposes, and thousands of people are seen bathing daily. Many vegetable matters, such as rice, flowers, fruits, and leaves, are largely thrown into the tanks as necessary items of religious ceremonies. These get decomposed and vitiate the tank. During the festival the water must have grown very filthy indeed. The mass of pilgrims, who had every form of physical disadvantages predisposing them to disease, drank this concentrated filth in the shape of water, and so added another potent cause of sickness to many already existing. There is no existing means of draining the city. It is said that the roads serve the purposes of surface drains, while there is absolutely no provision for subsoil drainage."

With regard to conservancy, the efforts of the Health-Office establishment were mainly confined to street conservancy, and to providing a few latrines for public use.

But they were not comprehensive, and the "work of removing night-soil had just begun when the great festival and epidemic cholera occurred. The conservancy arrangements in private houses are bad; the private latrines consist of holes dug in the earth, and when one is filled another is opened, until all available ground is dotted with these inadequately covered pest-holes. The accumulated ordure of years within a few feet of dwelling-houses must necessarily keep the dwellers obnoxious to causes of ill-health. . . . This was not an exceptional state of things in the epidemic of 1877. This state of things has, I believe, continued ever since the city became an object of religious pilgrimage." (Report by the civil surgeon.)

The districts of Chota Nagpore enjoyed practically a complete immunity from cholera in 1877, and what cholera existed was sporadic in character. During several months there was no sign of the presence of the disease, and altogether only about one village in 200 recorded its presence during the year.

The following tabular statement, furnished by the Sanitary Commissioner for Bengal, shows at a glance the chief meteorological conditions of the year and the monthly mortality from cholera, compared with the other principal death causes:—

STATEMENT *showing the Chief Meteorological Conditions of the Year* 1877 *and the Monthly Mortality from Cholera, compared with the other Principal Death Causes, in the Bengal Province.*

Meteorology.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year 1877.
Atmospheric pressure .	29·434	29·372	29·252	29·206	29·081	28·961	28·949	28·955	29·115	29·209	29·202	29·308	29·188
Mean temperature of air	64·1	63·3	75·5	78·2	83·1	83·9	82·2	82·0	82·3	78·6	73·5	65·7	75·7
Mean range . . .	19·6	19·8	21·6	21·0	19·1	14·9	11·2	10·9	11·8	15·3	20·2	20·8	17·3
Humidity . . .	72	69	63	65	70	71	84	84	81	75	69	69	73
Rainfall	1·81	2·23	1·23	2·66	5·01	7·64	13·61	12·69	8·72	2·71	·10	·46	58·871
Mortality.													
Cholera	38,142	18,216	11,872	17,187	12,140	5,478	4,943	4,759	5,280	5,983	13,713	17,592	155,305
Smallpox . . .	424	633	1,196	1,518	1,292	963	574	350	194	205	261	478	8,088
Fever	48,400	41,623	45,785	53,458	51,941	45,483	47,116	52,605	58,667	68,013	92,403	105,543	711,037
Bowel complaints . .	4,620	4,393	4,729	5,160	4,775	3,849	4,221	4,590	4,887	5,448	5,837	6,453	58,962
All causes . . .	101,796	74,124	73,824	88,689	81,470	67,308	69,440	76,020	82,746	93,209	125,081	143,894	1,077,601

Referring to this statement, Dr. Coates observes that—

"In considering the influence of atmospheric changes on sickness and mortality, it must be borne in mind that in this province many sources of disease are always present, such as soil saturated with sewage matter and water polluted by all sorts of impurities, while the population is poor and ignorant, and badly clothed, housed, and fed. The mortality in January and February is not usually higher than that in November and December; but in 1877 it was very considerably so, owing to severe epidemics of fever and cholera following the cyclone of October 1876 continuing in operation during the earlier months of 1877 in considerable portions of the eastern districts of Bengal. It is consequently difficult to determine to what extent the increased mortality was influenced by the climatic conditions of the period in the areas so exceptionally affected, though in the districts not affected by the cyclone the increased atmospheric pressure and unusually low temperature of January and February were coincident with a slight increase in the total number of deaths registered during those months. As regards the cholera mortality in its relation to the meteorology, it was severe from March to May, when the atmospheric pressure and the temperature were high; the mortality declined from June to September, when the moisture in the air was great and the rainfall was constant and abundant; and it again became very severe from October, when the rains ceased, and during November and December, when the humidity of the air had decreased and evaporation had become very rapid. In other words, cholera was widespread and severe when the atmospheric pressure was high, the humidity of the air least, and the rainfall at its minimum or almost absent; and it declined in prevalence when the proportion of moisture in the air was great and the rainfall heavy."

Regarding the food-supply, it is recorded that—

"On the whole, the year 1877 was a year of average plenty. In the majority of districts the outturn of the crops was more or less above, or equal to, the average yield. In twelve districts it was below average, and in seven, viz., Backergunge, Mymensingh, Chittagong, Noakholli, Nuddea, Balasore, and Poori, it was very bad. Although the harvest of the year was on the whole good, the prices of food-grains had risen very considerably as compared with the average prices of the three years which preceded 1877, excluding 1874, the famine year. This great rise in prices was partly due to drought having reduced the quantity of grain available, but chiefly to exportations to the famine districts in Southern India and the North-Western Provinces. The rise was greatest during the third and fourth quarters of the year, particularly the last."

No injurious effect on the general health was attributed in the local reports to the high prices of food, except in the districts of Murshidabad, Dacca, Chittagong, Tipperah, Noakholli, Cuttack, and Poori, where the scarcity was severely felt, and the health of the people impaired from this cause. "There can be little doubt, however, that in a country like Bengal, where large bodies of the people are in a chronic state of extreme poverty but little above starvation point, any general rise in price must mean extreme suffering and a greatly diminished power of resisting disease, although, with our imperfect registration, these results may not be apparent in the death-rate. The large exportations of food-grains would show that the yield was sufficient to meet this contingency as well as to provide for home consumption. In fact, to the land-holding class, which is very large in Bengal, high prices and exportation are a boon, as they enable the people to dispose of their surplus stock at a profit, thus enhancing their material prosperity and affording them the means of paying off their debts. But on the mere day-labourers and the classes who have small fixed incomes the dearth entails great hardship." The general rise in prices, it is stated, had no effect on the value of labour. "It remained stationary in all the districts except Nuddea, Murshidabad, Furridpore, Mymensingh, Tipperah, and Maldah, where it was somewhat higher than in 1876; but the reports do not show that this rise was due to dearness of food."

1878.—In this year, among the civil population of the province, the returns show the cholera of 1878 to have been considerably less prevalent than that of 1877. During the year 1878 cholera visited every district,

and was present in every month, as shown in Tables Nos. I. and II. Compared with the results of the preceding year, it is recorded that, of the 673 registering circles, it prevailed epidemically in 46 against 88, was severe in 67 against 103, mildly prevalent in 518 against 410, and entirely absent from 4 against 62; and it affected 18,821 villages against 23,041. The total deaths registered amounted to 95,192, or 1.58 per mille of population under registration, against 155,305, or 2.58 per mille. Thus both the extent of prevalence and fatality of cholera in 1878 were markedly less than in 1877. There were, however, as in former years, special localities in which the ravages of the disease were severely felt, and the districts that suffered most are the following:—

Districts.	Ratio per Mille.	Districts.	Ratio per Mille.
Poori	9·83	Nuddea	2·97
Cuttack	4·06	Jessore	2·93
Purneah	3·85	Darjiling	2·80
Bhagulpore	3·76	Howrah	2·56
Hazaribagh	3·16	Balasore	2·36
24-Pergunnahs	3·06	Jalpaiguri	2·26

The figures of the monthly mortality (see Table No. II.) show great prevalence of cholera in January, very considerable decline in February, great increase in March, continuing up to May, with a maximum of prevalence in April, sudden decline in June, continued steady decline month by month to October, increase again in October, continued with greater prevalence in December. The great prevalence in January was a continuance of the preceding year's cold-weather epidemic, which, as usual, finally subsided in February. The rise for this year's cold-weather epidemic is not so great as in some former years, and commences later, due probably to the prolonged continuance of the rains.

The year 1878 opened with a more or less severe prevalence of cholera in Bengal and Orissa. Within this area the disease continued to prevail with increasing virulence up to May in Bengal, and up to the end of the year, with slight intermissions in February, October, and November, in Orissa. In Darjiling and Julpaiguri, however, its prevalence commenced and also ended later, viz., from April to September. In Bengal the intensity was subdued generally from June to September, and the winter increase was from October to December. Chota Nagpore suffered severely only from March to August, and was comparatively free from the disease during the rest of the year. East Behar, with the exception of Shahabad and Darbhanga, showed a marked immunity from the disease throughout the year.

In the western districts of Bengal, as a whole, cholera prevailed more extensively and with greater fatality in 1878 than in the preceding year. The months of greatest prevalence were January to April and November and December. The disease was present in 2072 villages against 1711, and the mortality amounted to 1.29 against 0.88 per mille of population in 1877. But there were certain localities within this area in which the reverse was the case. Thus in Beerbhum the mortality from cholera in 1878 stood at 1.86 against 2.42 per mille of population in 1877, and the area affected was covered by 4659 villages against 5885 in the preceding year. In Dinagepore cholera prevailed with great mildness in November and December, while it was very severe in the same months of 1877; this immunity is attributed to the heavier rainfall of 1878, and to the floods of the River Parnobaha. In

Rajshahye there was exceedingly little cholera in 1878; and in Darjiling, while the town was entirely exempt from the disease, it prevailed with much severity in the Terai, and spread as far as Kurseong, which also suffered much.

In Eastern Bengal there was a very great reduction of cholera in 1878, both in regard to its extent of prevalence and fatality. Only 4428 villages were affected against 7828 in the preceding year, and the mortality fell to 1.18 against 6.63 per mille of population in 1877, the high mortality of which year was largely due to a continuation through its earlier months of the cholera epidemic which followed the cyclone inundation of October and November 1876. In this portion of Bengal it is an established fact that the months of greatest prevalence of cholera are January to May, and November and December, the rainy months being those of greatest immunity.

In Dacca the cholera of 1878 prevailed somewhat severely, and became general from the end of March to the end of April. The usual autumnal epidemic did not commence until December, and was very mild in character. This delay in its appearance was attributed to the heavy inundation which began in the end of July and continued to the end of September, when the rivers rose higher than they had ever been known to have done before.

In the Orissa districts cholera prevailed very severely in 1878, both the area covered by the disease and the mortality caused by it being greater than in the preceding year. The number of villages attacked were 3678 against 2921 in 1877, and the death-rate 5.10 against 4.11 per mille of population. The prevalence of cholera in these districts has been generally attributed to importation by pilgrims; but in refutation of this notion the magistrate of Cuttack very pertinently remarks—

"The Rathjatra festival occurred this year on 3d July, and since 1873 it has never been earlier than the 23d June. Pilgrims march down through Gya, Hazaribagh, Manbhum, Bankura, Midnapore, Balasore, and Cuttack to Poori. There is, therefore, no reason for supposing that they would bring cholera into the district until their return after the ceremony, *i.e.*, in July. Pilgrimage, therefore, cannot be the cause of cholera which rises to strength in May. Again, Jagatsingpur, which lies off either line of pilgrimage route, was the circle affected most last year. This year it has been comparatively free. It is also noticeable that in this year, as in the last, there was a double wave of cholera; yet last year the heaviest mortality was in March and April, *sinking into insignificance in May, June, and July*, and rising again in August, to culminate in September. But in 1878 the first wave did not gain its strength till May; and thereafter, lessening in June, it culminated for this year in July, falling very low in September (the highest month of the previous year), and then, gaining strength again in November, it almost equalled the intensity of the ravages in July. Now last year the Rathjatra was only a few days earlier than in this year. It should be observed that the year 1878 has been one of peculiar rainfall and freedom from floods. This implies, what actually occurred, a great lowering of the water-level below the soil. The wells in Cuttack were pronounced never to have been so low for years. Frequent showers occurred during April and the early part of May, after which the rain totally ceased until the last week of June. Here, then, we find the mortality greatly increasing, and not checked till the last week in June, when copious rain (7 inches) fell."

In the districts of Chota Nagpore cholera prevailed more extensively and with greater fatality in 1878 than in the preceding year; 687 villages were affected against 195, and the death-rate was 1.06 against 0.09 per mille of population.

The rainfall of 1878 in this province, though differently distributed as to locality, was, on the whole, as abundant as that of the preceding year, and seasonably supplied. The fall in the first quarter of the year was, however, less than half that of the same period in 1877, whilst the fall in the last quarter was considerably greater (as 5.06 inches to 3.51 inches) than that of the corresponding period of the preceding year.

The price of food rose greatly during the year, and the average price of rice was higher than in the famine year, 1874. In 1878 the average price of rice for the province as a whole was 13.16 sers the rupee against 18.19 sers the rupee in 1877. This great rise was largely due to the great exportation of food-grains to the famine districts of the Madras Province.

1879.—In this year cholera, instead of declining in prevalence, as was due in the normal course of its cyclic career, prevailed with greatly increased intensity, not far short of double that experienced in the preceding year. This irregularity was coincident with a deficient rainfall and prolonged continuance of famine rates for food. Among the civil population of the province the cholera mortality registered in 1879 exceeded that of 1878 by 41,171, the figures for the two years being 136,363 and 95,192 respectively, and the death-rates 2.27 and 1.58 per mille. It is recorded that the disease in 1879 visited every district and was present in every month. Of the 673 circles, it prevailed epidemically in 87 against 46 in 1878, was severe in 98 against 67, mildly prevalent in 458 against 518, and entirely absent from 30 against 47; and it affected 23,663 villages, or 12.39 per cent. of the total number of villages in the province, against 18,821, or 9.75 per cent., in 1878. The urban circles returned 11,513 deaths, or 4.90 per mille of population, against 8752, or 3.69 per mille, in 1878; and the rural circles returned 124,850 deaths, or 2.16, against 86,440, or 1.49 per mille.

The seasonal incidence of the disease in the four great divisions of the province, and in the province as a whole, during 1879, are shown in the following abstract statements, together with the rainfall:—

Cholera in Bengal Proper in 1879.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths . .	5,093	2,948	6,257	8,786	7,678	5,849	3,526	1,163	898	925	3,203	7,587
Rainfall . .	·03	·081	·08	·62	5·03	15·93	17·93	14·23	12·22	4·73	...	·28

Cholera in Behar in 1879.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths . . .	241	258	538	1,619	6,520	17,093	16,101	11,541	3,194	1,112	635	197
Rainfall . . .	...	·97	·008	...	1·07	8·30	16·11	13·42	16·04	6·10	·008	·05

Cholera in Orissa in 1879.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths . .	747	777	1,333	901	1,019	4,107	2,574	332	104	82	124	80
Rainfall . .	...	·13	·83	...	4·35	4·29	11·92	13·32	12·88	5·18	·37	1·31

Cholera in Chota Nagpore in 1879.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	8	23	49	42	622	3,098	3,601	2,909	743	118	6	2
Rainfall.	...	1·12	·002	...	1·19	6·23	11·64	12·84	7·75	3·04	...	·03

Cholera in the Bengal Province in 1879.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	6,089	4,006	8,177	11,348	15,839	30,147	25,802	15,945	4,939	2,237	3,968	7,866
Rainfall.	·02	·83	·11	·37	3·64	12·35	16·50	13·84	12·82	4·95	·02	·27

There is little to be recorded regarding the deportment of cholera in 1879 which differs from what has been written in the review of previous years. It is, however, noticed that in a year of great prevalence of cholera the large number of fairs held in the province were almost exempt from the disease. The local reports show that, excepting in Balasore and Poori, towns where, as usual, the pilgrims suffered severely from cholera and bowel complaints, the disease appeared only in the following fairs, viz., at Tarkesar fair, in Hooghli, 5 cases; at Baruni fair, in Dacca, 3 cases; at Ganga Sagar, in the 24-Pergunnahs, and at the Nekmard fair, in Dinagepore, only a few cases. "At some of the large fairs, where the gathering is great and which lasts for any length of time, sanitary precautions against the outbreak of the disease are taken; but at many of such fairs, and, as a rule, at the smaller fairs, which last for a very short time, little or no care is taken."

Regarding the seasonal prevalence of cholera in the Dacca district, the civil surgeon, Dr. Crombie, says—

"In this district there are great seasonal influences at work which overrule the local existing causes of cholera, overpower them in the months of July, August, and September, allow them to reassert themselves in October, and induce them, in their greatest intensity, in December. In January they are less active than in December, and in February than in January. In March the seasonal causes are apparently sometimes more favourable and in some years more opposed to local outbreaks than in February; but in April the rein is given again to them, to be followed by a check in May, and still more so in June, until they finally disappear in July." Referring to the seasonal prevalence of cholera in Dacca in relation to the level of the subsoil water in the years 1877, 1878, and 1879, it appears, as Dr. Crombie writes—"That in these years the April outbreak of cholera was accompanied by greater or less fluctuation of the subsoil water at its lowest level for the years. That in 1877, when the April outbreak was of greater intensity than in the two succeeding years, the mean level of the subsoil water was 3 feet higher than in 1878 and 1879. That in May, with a steadier level of the subsoil water, cholera diminishes, and with a rapid rise of the subsoil water-level in June it disappears as an epidemic. That when the level is at its highest, and the surface of the country flooded and deluged with frequent rain from July to September inclusive, there is practically no cholera. That in October, the rains being over, a fall of 2½ feet in the subsoil water-level was accompanied in 1877 by a fresh outbreak of cholera, numbering between 600 and 700 deaths, but in 1878 there was no such outbreak. That the rapid fall of the level from 7½ to 15 feet in November and December 1877 was accompanied by about 3300 deaths from cholera, while the scarcely less rapid fall during the same months of 1878 from 6¼ to 13½ feet was accompanied by 1100 deaths. That the steady fall of level in January and February in each of the three years was accompanied by a marked diminution of the number of cholera deaths. That in March 1879 there was an increase of cholera while the water-level was still falling, while in the other years there was less

cholera. There was, however, a slight fluctuation of the water-level in February 1879; and if the dry-season outbreak can be attributed to such a fluctuation at low levels, this may have affected the returns for March, there being often great delay in registering deaths in this district. . . . But it is evident that the rapid fall of the level of the subsoil water in October, November, and December must be accompanied, in a porous, sandy soil, by a free emptying of the cesspools into the adjoining wells; but the fall is just as rapid and the interchange of contents probably just as free in January, February, and March, the cesspools having in the meantime received the cholera stools of the three previous months, and yet cholera is declining in these months."

Meteorology.—The mean temperature for the year was slightly in excess of the average generally at all stations. The rainfall of the whole year was very considerably below the average (about 20 inches) in the whole of the Burdwan division, and over the greater part of the presidency and Dacca divisions, the deficiency varying greatly. On the other hand, it was very considerably in excess over the whole of Behar and Northern Bengal, the excess averaging 8.25 inches.

The result of the generally abundant rainfall was a favourable harvest of the staple food-grains on which the people subsist; nevertheless the high prices of the preceding year were maintained at much the same rates for the province as a whole. In several districts the prices rose higher than in the preceding year, in some they were the same in both years, and in only a very few districts were they lower in 1879. This continuance of high prices was owing either to short harvests or exportations from one district to another, or to the famine districts in the preceding year. It is recorded that "at Howrah the Northern Bengal State Railway has caused a large export trade in rice, and therefore the prices of the famine year, 1874, were reached in a year of great prosperity." It is stated also that like fluctuations attended the value of labour, in the agricultural districts a good crop being generally followed by a rise in the price of labour. "The general health of the people does not appear to have been in any way seriously affected by the dearness of food; but while cultivators, traders, artizans, and hired labourers were much benefited, the high prices proved a great hardship to the poor consumers, the non-cultivators, and those whose incomes are limited." This was specially the case in Cuttack, Bhagulpore, Poori, Furridpore, and in some places in Jessore, Dacca, and Nuddea. In these localities the people suffered chiefly from fevers and bowel complaints.

1880.—In this year, the last of the triennial cycle 1878–80, cholera suddenly subsided to a minimum of prevalence. Among the civil population the death-rate fell to 0.66 per mille from 2.27 in 1879, the total number of cholera deaths registered being 39,643 against 136,363 respectively, the decrease being 96,720 deaths. The disease visited every district, and was present in every month of the year; it prevailed epidemically in only 19 circles against 87 in the preceding year, was severe in only 45 against 98, was mildly prevalent in 493 against 458, and was entirely absent from 118 against 30. It affected 9447 villages, or 5.02 per cent. of the total number of villages in the province, against 23,663, or 12.39 per cent. in 1879. The mortality registered in the urban circles as a whole amounted to 3253 deaths, or 1.37 per mille of population, against 11,513, or 4.90 per mille, in 1879; for the rural circles the figures are 36,390, or 0.63 per mille, against 124,850, or 2.16 per mille, respectively. Contrary to the experience of 1879, both the urban and rural circles suffered to a considerably lesser extent, the preponderance in the rate of abatement being observable in the urban circles.

The seasonal incidence of the cholera of 1880 is shown in the following abstract statements separately for each of the four divisions of the province, and for the province as a whole, together with the rainfall of each month :—

Cholera in Bengal Proper in 1880.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	4,237	3,449	3,053	2,596	1,705	287	328	269	208	246	723	3,043
Rainfall.	·48	3·12	2·52	1·98	8·41	19·41	13·79	16·38	10·57	6·25	·12	·20

Cholera in Behar in 1880.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	37	19	210	2,910	4,136	2,570	679	454	113	80	160	88
Rainfall.	·29	2·35	·14	·24	2·18	7·03	15·83	13·89	3·36	3·87	·21	·21

Cholera in Orissa in 1880.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	147	666	1,263	695	325	184	358	392	436	470	865	1,456
Rainfall.	·07	1·78	·22	1·18	6·01	14·61	11·79	17·88	12·35	7·06	3·32	·05

Cholera in Chota Nagpore in 1880.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	5	25	135	77	94	154	137	22	12	122	1	2
Rainfall.	·17	2·79	·45	·32	6·47	8·91	9·20	16·38	9·76	4·04	·33	·09

Cholera in the Bengal Province in 1880.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths .	4,426	4,159	4,661	6,278	6,260	3,195	1,502	1,137	769	918	1,749	4,589
Rainfall.	·37	2·81	1·58	1·34	6·51	15·04	13·75	15·86	8·81	5·51	·38	·18

These statements show that the seasons of greatest and least prevalence of cholera in 1880 correspond very nearly with its seasonal distribution in the five years from 1875 to 1879 inclusive in Bengal Proper, Behar, and Chota Nagpore, but not in Orissa, where the uniformity is marred by marked differences, which are probably attributable to the presence or absence of pilgrims in this division of the province. In 1880 cholera affected less than half the area that was affected by the disease in 1879, and it prevailed, on the whole, more extensively during the first half of the year than during the second half, in which latter the abatement is most marked; whilst the usual autumnal exacerbation of the disease commenced a month later than is ordinarily the case, viz., in November instead of in October.

Excluding local epidemic outbreaks of cholera, the general incidence of

the disease in the province as a whole during 1880 may be thus summed up. In Bengal Proper the declining epidemic of 1879 was continued into the earlier part of 1880 in its eastern, southern, and western districts, with the exception only of Noakholli; and in the area covered by them cholera continued to prevail with more or less severity up to June; after which month the disease gradually subsided, and its autumnal revival was prominently marked only in the southern districts of Central Bengal, its prevalence in the remaining districts being mild. In Behar, contrary to the experience of 1879, there was very little cholera in severe form; Chumparun, Mozufferpore, and Shahabad, where it prevailed from March to June, being the only districts that show this tendency. In Orissa, as in the preceding year, cholera prevailed in very severe form almost throughout the year in all the three districts of the division. In Chota Nagpore, which suffered epidemically in 1879, there was a marked immunity from cholera in 1880, the only district in which the disease was severe being Singbhum, where it prevailed during February to May.

In connection with the influence of rainfall on the prevalence and fatality of cholera, it is to be observed that in 1880 the rainfall of the year (72.22 inches) was not only excessive, but was also considerably larger in amount than that of 1879 (65.45 inches), as well as that which represents the average of the twenty years of our series (65.34 inches); and further, "that with this excessive rainfall a correspondingly great abatement of cholera prevalence and mortality has taken place as compared not only with 1879, but also with any year since 1875, taking the latter year as the turning-point in the better registration of deaths." In Bengal Proper and Orissa, as has always been the case, cholera was least prevalent in those months in which the largest amount of rain fell, and was most prevalent in those months in which the least amount of rain fell. In Behar and Chota Nagpore, on the other hand, the contrary was the case. In these more elevated portions of the province the prevalence of cholera was greatest in those months in which the rainfall was heaviest, and least in those months in which the rainfall was lightest. In other words, in the low lands of the province the season of cholera prevalence is the dry, rainless weather, and in the high lands the season is the wet, rainy weather, and *vice versâ*.

It is observed as noteworthy "that at the great majority of the fairs no attacks of the disease occurred." The exceptions are the following:—At the two fairs held at Tarkesar, in Hooghli, there were 19 cases of cholera, with 9 deaths. In the March fair, lasting two days, the gathering of people was about 15,000; and in the April fair, lasting five days, about 40,000 people. At the Ganga Sagar fair, in the 24-Pergunnahs, held in January, and lasting a week, only 5 cases of cholera occurred among an assemblage of about 84,000 people. At the Kuri fair, held in April on the east bank of the Ganges, in Maldah, which lasted eight days, and where about 70,000 people were assembled, 2 or 3 persons were attacked with cholera, but they recovered. At the Baroni fair, in Dacca, "held on the 16th November, which lasted six weeks, and where about 40,769 people and 31,770 boats were collected, only 3 cases of cholera occurred which ended fatally." At the Adapur fair, held in April, at Chumparun, which lasted twelve days, and where about 5000 people were assembled, "there occurred an outbreak of cholera, of which no particulars were furnished." On the other hand, at the Baklipur fair, in Beerbhum, which lasted eight days, and was attended by about 30,000 people, "no cholera occurred, although it was very prevalent at the time in villages close by."

Regarding the prevalence of cholera in the Poori district, it is stated that the disease existed in the Poori town and district in the beginning of the year, and prevailed in one part or another of Poori throughout the year with increased intensity as compared with 1879, and that "it exhibited increased vigour at three different times which corresponded with the influx of pilgrims into the district, as has been the case for years," viz., in February and March, when pilgrims come for the Doljatra festival, which took place on the 26th March; again in July, for the Rathjatra, which took place on the 9th of that month; and a third time, from September to November, in the latter month the great Car festival being held for a fortnight. It is mentioned, also, that at other large fairs in this district, held during the periods above mentioned, there was no cholera, viz., at the Chandra Bhoja fair, held at Gôp in April, where 40,000 people were assembled; at the Uttia Amabosya fair, held in Poori itself in July, where 15,000 people were assembled; and at the Panchak fair, held also in Poori from the 13th to 17th November, and at which 10,000 people had assembled.

Regarding the cholera of 1880 in the Hazaribagh district, it is stated that the only serious outbreaks were those that occurred in the Gawan circle, which is situated in the north-east corner of the district, projecting between Monghyr and Gya. It lies low, is fertile and well cultivated, and traversed by the river Sakri, along the left bank of which the pilgrim route from Gya runs. The first outbreak occurred in March, and lasted till June; the second occurred in October; and both outbreaks were strictly limited to this circle. "The first case occurred on the 2d March in the person of a pilgrim coming from Gya, on the road between the villages of Basodi and Simaldi, in the Gawan circle. After this two persons belonging to these villages were attacked. By the 14th March a good number of cases occurred in both villages. By the 16th the disease spread to the large but filthy village of Gawan, situated on the pilgrim road to the south of the villages in which it first appeared. The first case in Gawan occurred in a woman who had not left the village for some time previously. . . . From the 30th March the disease spread farther, subsiding in some villages and attacking others. Towards the end of May it declined to a great extent, and disappeared finally by the 17th June, having lasted a little over three months. In all, 387 persons were reported to have been attacked, and 264 to have died, during this outbreak. The following villages showed very large proportions of population attacked and deaths to cases:—

Villages.	Population.	Cases.	Deaths.
Bhakra	100	56	33
Basodi.	300	92	61
Pokhardiha. . . .	150	32	25
Chandi	70	18	13

It is stated in connection with this outbreak that in the last week of May 3.7 inches of rain fell, and in the first week of June 5 inches. "This corresponds with the time, as before stated, of the subsidence and final disappearance of the disease." With reference to the prevalence of cholera generally in this district, the civil surgeon says:—

"That he has observed that in those years in which there is a deficient rainfall in the early part of the rains the disease spreads to the high lands of the district, but that when the rains are plentiful this extension is prevented; and that, dividing the districts

into two parts, high and low lands, the former being about 1800 to 2000 feet and the latter about 600 feet above the level of the sea, the periods of cholera prevalence in them differ. In the high lands cholera does not spread until the rains have well set in, while the contrary is the case in the low lands, as here cholera generally occurs in March, April, May, and the beginning of June, as at the Gawan outbreak; and that the extension of the disease from the lower to the higher levels depends very much on the quantity of rain which falls in the end of the hot weather and the earlier part of the rains. If it is copious, the extension appears to be prevented."

There was a great improvement in the prices of food in 1880. A general reduction in prices commenced in the second quarter, and rates continued falling to the end of the year. This was the natural consequence of the unusually abundant and well-distributed rainfall, and the most favourable harvest thereby ensured, coupled with the general cessation of exports, and to some extent also of monopolies in the grain trade.

1881.—In this year, the first of a new triennial cycle, cholera prevailed with a revived epidemic activity. Among the civil population the death-rate rose to 1.32 from 0.66 per mille of population respectively. Yet the year 1881 was one of abundant rainfall and unusually cheap rates for food; and these conditions were very probably not without some effect in influencing the mildness of the revived epidemic activity of the disease, which reappeared with renewed force in the normal course of its cyclical prevalence. The mortality registered from cholera in 1881 gives a death-rate per mille of population under registration just double that of the preceding year. Of the 79,180 deaths registered, the urban circles contributed 7104, or at the rate of 3.01 per mille, and the rural circles 72,076, or at 1.25 per mille. The cholera of 1881 prevailed epidemically in 41 circles against only 19 in the preceding year, was severe in 52 against 45, mildly prevalent in 501 against 493, and entirely absent from 80 against 118. It appeared in 23,250 villages, or 12 per cent. of the total number of villages in the province, against 9447, or 5 per cent., in the preceding year.

The seasonal prevalence of the disease for the province as a whole is shown in Table No. II. The figures show that the revived activity of cholera which took place in the usual course in the preceding autumn—commencing in October and reaching its climax in December—had begun to abate in January of this year, and in the following month fell to the minimum of its spring prevalence; that in March the cholera of 1881 started into activity with a fatality nearly treble that to which it had subsided in February, and rapidly advancing, attained the climax of the year in April, with a mortality in that month more than two and a half times greater than that acquired in the preceding month; that in May the disease abated very markedly and suddenly, the mortality falling to somewhat above half that registered in April; that this abatement was continued throughout June, the mortality in that month having fallen to somewhat less than half that of May; that during July and August this course of abatement received a decided check, and the disease prevailed with a slightly increased activity; but that in September the abatement was resumed by a sudden and marked fall in the mortality, which now sank to the minimum of the year, the deaths having fallen to about one-third the number registered in the preceding month; that during October cholera remained at the minimum prevalence of the year, but with a sensible tendency towards a renewal of activity; that in November this tendency to renewal of activity became fairly established by a marked increase of mortality; and, finally, that this activity was continued with increasing force throughout the following month, the year closing with a mortality in December more than double that of November.

The distribution of the cholera of 1881 over the general area of the province, as usual, was very unequal. In Bengal Proper the epidemic, or severe prevalence of the disease, was centralised in the abutting districts of Burdwan, Midnapore (excepting the Ramganj subdivision), Serampore, Howrah, 24-Pergunnahs (excepting the Baraset subdivision), Nuddea, Jessore, Murshidabad (excepting the Jangipur subdivision), Rajshahye, Pubna (excepting the Serajganj subdivision), and Dacca. The rest of Bengal Proper, with the exception of the subdivisions—far away from the above areas—of Patnakhali in Backergunge, Sadr and Kurigram in Rungpore, Bishanpur in Bankura, and Goalundo in Furridpore, enjoyed great immunity from the disease. In Behar the epidemic prevalence of cholera was mainly confined to its western division. Here Patna, Gya, Shahabad, Sarun, Chumparun, and Mozufferpore districts, which adjoin one another, suffered epidemically or severely in all their subdivisions, with the exceptions of the outlying subdivisions of Bhabuah, in the extreme west, in Shahabad; Beltia, Gopalganj, and Sewan, in the extreme north-west and west, in Chumparun; Sitamarki, in the extreme north-east, in Mozufferpore; Bark, in the extreme east, in Patna; and Aurangabad, in the extreme south, and Nowada, in the extreme south-east, in Gya, which were visited very mildly. The whole of Darbhanga also enjoyed this freedom. In the eastern division of Behar only the Sadr subdivisions in Monghyr and Bhagulpore, which adjoin each other, and Patna suffered very much, the rest of the country escaping to a very great extent. The whole of Orissa suffered, as usual, either epidemically or severely. The whole of Chota Nagpore, as in the preceding year, enjoyed great immunity from the disease.

The following are among the circumstances recorded in connection with the incidence of the cholera of 1881 in the districts:—

In Burdwan district the cholera death-rate exceeded that of the preceding year by 1.05 per mille of population; the highest death-rates were recorded in Burdwan town, 5.35 per mille; Burdwan rural circle, 4.66; and Cutwa, 3.38. "The town of Ramganj, in which the disease causes great havoc year by year, enjoyed great immunity from it in 1881."

In Midnapore district cholera appeared in the town of Midnapore at the time that pilgrims were passing by it in large numbers, viz., in February and March for the Doljatra, and in July and August for the Rathjatra; and violent outbreaks occurred in Danton rural circle, which is also largely traversed by pilgrims, as well as in Marlandpur and Bhagbanpur rural circles, which are not pilgrim routes. "The last-named place has of late years obtained a bad reputation for cholera." On the whole, there was less cholera in this year than in the preceding; but the areas of greatest suffering were Khajri rural circle, with a death-rate of 4.22 per mille, and Midnapore town, 3.81.

In Serampore district it was observed that the winter outbreak of cholera was severer in this year than it had been for some years previous. "This was referred to the cold weather being more intense than during the last few years." The highest death-rates were recorded in the town and rural circle of Serampore, viz., 7.24 per mille in the former, and 6.02 in the latter. In Uttarpara and Baidyabati rural circles the death-rates were 3.64 and 3.60 per mille respectively.

In Howrah "it was observed that the disease attacked with the greatest fatality the overcrowded and ill-ventilated localities of the town of Howrah, which suffered more than any other place, furnishing a death-rate of 5 per mille of population."

In the 24-Pergunnahs it appears that, on the whole, there was more cholera, and that the total mortality from it was higher by 1.32 per mille of population than in the preceding year. The highest per mille death-rates were recorded in the suburbs of Calcutta, 7.66; the north suburban town, 3.97; and in the rural circles of Sultanganj, 4.47; Diamond Harbour, 3.51; and Debipur, 2.84.

The Nuddea district suffered considerably from cholera, the total death-rate amounting to 3.38 per mille of population, and exceeding that of 1880 by 2.92 per mille. In sixteen places recording the highest mortality the death-rate ranged between 3.50 and 12.37 per mille. In the preceding year two of these sixteen places recorded no cholera, and in the other fourteen the death-rate ranged between 0.02 and 2.37. The two places which escaped the disease in 1880 in this year returned death-rates of 9.26 and 9.14 respectively. In Jessore, of six circles suffering severely, the death-rate ranged between 3.00 and 17.47 per mille of population. In Murshidabad, of five circles suffering severely, the death-rate ranged between 3.08 and 8.32 per mille.

In Rajshahye cholera prevailed chiefly in the southern parts of the district, and in its severe form in the rural circles bordering on the River Ganges. The death-rate was 2.54 per mille, being 2.42 per mille in excess of that of the preceding year. The highest rates were in Baulia town, 7.35; Baulia rural circle, 7.37; in the rural circles of Charghat, 7.58; Panchupur, 4.35; Nathur, 4.11; and Godagari, 3.45.

In Pubna cholera appeared in the middle of March, in the southern part of the district, simultaneously in Pubna, Dulai, and Mathura rural circles, and carried off 3.59, 3.49, and 3.41 per mille of their populations respectively. The Mathura circle specially suffers almost every year. "The town of Pubna, which had been almost free of the disease for several years, was seriously attacked this year in the hot weather, and lost so much as 11.50 per mille of its population."

In Backergunge it was remarked that in the Bhola subdivision the disease prevailed the least. "The land here is the highest, and water accumulates and stagnates to a less extent in it than in the remainder of the district."

In Chittagong only 12 deaths from cholera were registered in the whole district, and the disease appears to have prevailed the least in the Chittagong division generally as compared with the rest in the province. Only 330 deaths were recorded in 3 per cent. of the villages against 1301 deaths in 6 per cent. of the villages in 1880.

In the districts of the Patna division, or West Behar, the mortality and prevalence of cholera in 1881 were considerably in excess of the preceding year. The total of deaths amounted to 17,874, or at the rate of 1.36 per mille of population, and the percentage of villages recording the disease was 9. The corresponding figures for 1880 are, deaths 10,567, death-rate 0.80, and percentage of villages 5. "The seasonal incidence of the disease differs in Behar from Bengal; for while in the latter the first four and last three months of the year are generally the periods of intensest suffering, in Behar the virulence of the disease is exhibited in the intermediate months of May to August."

In the districts of the Bhagulpore division, or East Behar, also, the cholera of 1881 prevailed with greater activity than in the preceding year, although not, on the whole, with any great degree of virulence. The total deaths registered in the division amounted to 3305, giving a death-rate of 0.49 per mille of population against 889 and 0.13 respectively in 1880.

In the Orissa division the prevalence of the cholera of 1881 was considerably greater than that of 1880. Compared with the other divisions in the province, the rate of suffering was greatest in this. The total deaths registered amounted to 10,963, or at the rate of 3.61 per mille of population, and 17 per cent. of the villages recorded the disease. The corresponding figures for 1880 were, deaths 7257, death-rate 2.39, and percentage of villages affected 11. The highest mortality was in the months of March, April, and July. In the Poori district "the disease was nearly as widespread as in 1880, but somewhat less fatal. It exhibited the same peculiarity in its incidence as in the previous year, viz., that it increased in activity at three different periods coincident with the influx of pilgrims to the Poori town." The three pilgrim-traversed circles of Poori town, and Poori and Pipli rural circles, show 1558 deaths against 604 for the rest of the district.

In the Port of Calcutta cholera prevailed more severely in this than during the preceding three years, as is shown in the following statement of yearly cases and deaths :—

1878 . .	Cases, 45.	Deaths, 29.	1880 . .	Cases, 23.	Deaths, 14.
1879 . .	„ 42.	„ 25.	1881 . .	„ 51.	„ 33.

Out of 43 sufferers whose history was known, no less than 33 were attacked within the first three weeks of their arrival in the Port, 1 each in the fourth and fifth weeks, and 8 in the sixth week and upwards; thus showing "that the liability to the disease is overwhelmingly greater for new arrivals. Drink and exposure to wet and cold also appear to be among the chief exciting causes."

The rainfall of 1881, although not so copious as the unusually heavy fall of the preceding year, was still considerably above the average fall for the province; it was about 3½ inches less than the fall in 1880, and about 3¼ inches more than the average fall for the twenty years of our series. It was also fairly distributed in the several seasons.

In respect to food-supply, the year 1881 was one of unusual plenty and exceptionally cheap prices. The average price of rice in this year was 26.50 sers per rupee, so low a rate not having been experienced since 1863.

Summary Review.—The statistics of cholera mortality among the troops and jail populations, and, so far as available, among the civil population, in the Bengal Province during the twenty years 1862 to 1881 inclusive, are shown in the series of tabular statements, Nos. I. to V., at the commencement of this section. The statistics relating to the civil population commence only in the year 1870, but those relating to the troops and jail populations are complete for the whole series of years. These latter statistics, as will be seen by reference to Table No. V., very clearly illustrate the triennial periodicity in the rise and fall of cholera prevalence, which is observed to be a characteristic feature in the deportment of the disease in the other provinces of India also. The statistics for the civil population also, so far as they go, are confirmatory of the same phenomenon.

The first of the triennial cycles for which we have the statistics commences in the Bengal Province, as in the other provinces of British India, with the year 1863; and the four consecutive triennial cycles ending with the year 1874 show the regular periodical rise and fall of cholera activity in each cycle without any abnormality—the first year of each cycle being that of maximum cholera activity, the second that of abating, and the third that of minimum activity. In the two succeeding triennial cycles embraced in the years 1875 to 1880 inclusive the regularity in the periodical rise a

fall of cholera activity presented in the preceding four triennial cycles is somewhat disturbed by abnormal prevalence of the disease within each of the two cycles. In both these cycles the year of maximum prevalence is transferred to the middle year of the triennial period, whilst in the earlier cycle, 1875–77, the year of minimum prevalence fell in the first instead of in the last year of the period. In both these cycles the irregularity or divergence from the normal course of the disease, in respect to frequency among the classes to which the statistics relate, was caused by unusual prevalence of cholera among the jail populations, and more especially in the years 1876 and 1879, of the earlier and later of the two cycles respectively, in which the distress and privation from famine pressed with unusual severity upon large masses of the labouring classes of the general population of the province. In the later of these two cycles cholera fell in the third year of its cycle to a minimum, in the normal course; and this minimum was smaller than that of any preceding year back to 1862, and was coincident with a year of plentiful harvests and cheap food. The cholera deaths among the jail populations, which in the preceding year amounted to 336, fell to only 29 in 1880. In 1881, the first year of the next triennial cycle, the returns for the troops and jail populations show a revived activity of cholera in the normal course for this year.

Regarding the course of cholera among the civil population of this province, statistics are available only from the year 1871, and these are avowedly very imperfect, both for that and the two or three succeeding years. Such as they are, however, they afford a tolerably fair index to the prevalence of the disease in the province generally, the ratios of mortality being calculated upon only the population under registration in each year; but mainly they are useful as marking out the seasons of cholera activity and repose, and the periods of its unusual prevalence.

In 1871, the last year of minimum cholera prevalence in the triennial cycle commencing with 1869, the returns show the cholera of the year to have been at a very low rate of prevalence among the civil population of the province; and this is in accordance with the results shown by the cholera statistics among the troops and jails.

In 1872, the first and normally the maximum year of cholera activity in the cycle ending with 1874, the returns show a decided increase and revived energy in the prevalence of cholera; and this is corroborated by the returns for the troops and jails. But in the following year, the second in the cycle, instead of abating, as was due in the normal course, the activity of cholera among the civil population was somewhat greater than that recorded in the preceding year; and this again is in accordance with the results shown by the army and jail returns, in which the bulk of the mortality among the troops and prisoners, both during 1872 and 1873, occurred among the jail populations only. In 1874, however—the last and normally the year of minimum cholera prevalence in the cycle—the returns for the civil population show a very marked increase in the prevalence and fatality of cholera among the portions of the population under registration in the "selected areas." A corresponding increase is not shown in the army and jail returns for this year, taken together as before; but taking the jail returns alone, there is a well-marked corresponding increase in the activity of the cholera of the year among that class of the population. This abnormal prevalence of cholera in this year of normally due minimum prevalence of the disease was coincident with a period of severe famine and drought over a very large area of the province.

In 1875, the first year of the next triennial cycle, cholera prevailed, in the normal course, with maximum activity; and this notwithstanding that the year was one of abundant harvests and comparatively very cheap food. During the next two years the disease steadily declined in activity; but the mortality continued at an unusually high rate in each year, owing to the recurrence of famine distress in some extensive areas of the province. The returns for the civil population show the cholera death-rate of 1875 to have been more than double that of the preceding year, the figures being 5.76 per mille against 2.36 respectively. In 1876, a year of much and widespread famine distress in many districts, the death-rate fell to 3.35 per mille, and in 1877 it fell still further to 2.58 per mille. These rates are exceptionally high for those years of the triennial cycle, taking registration generally among the civil population as a guide.

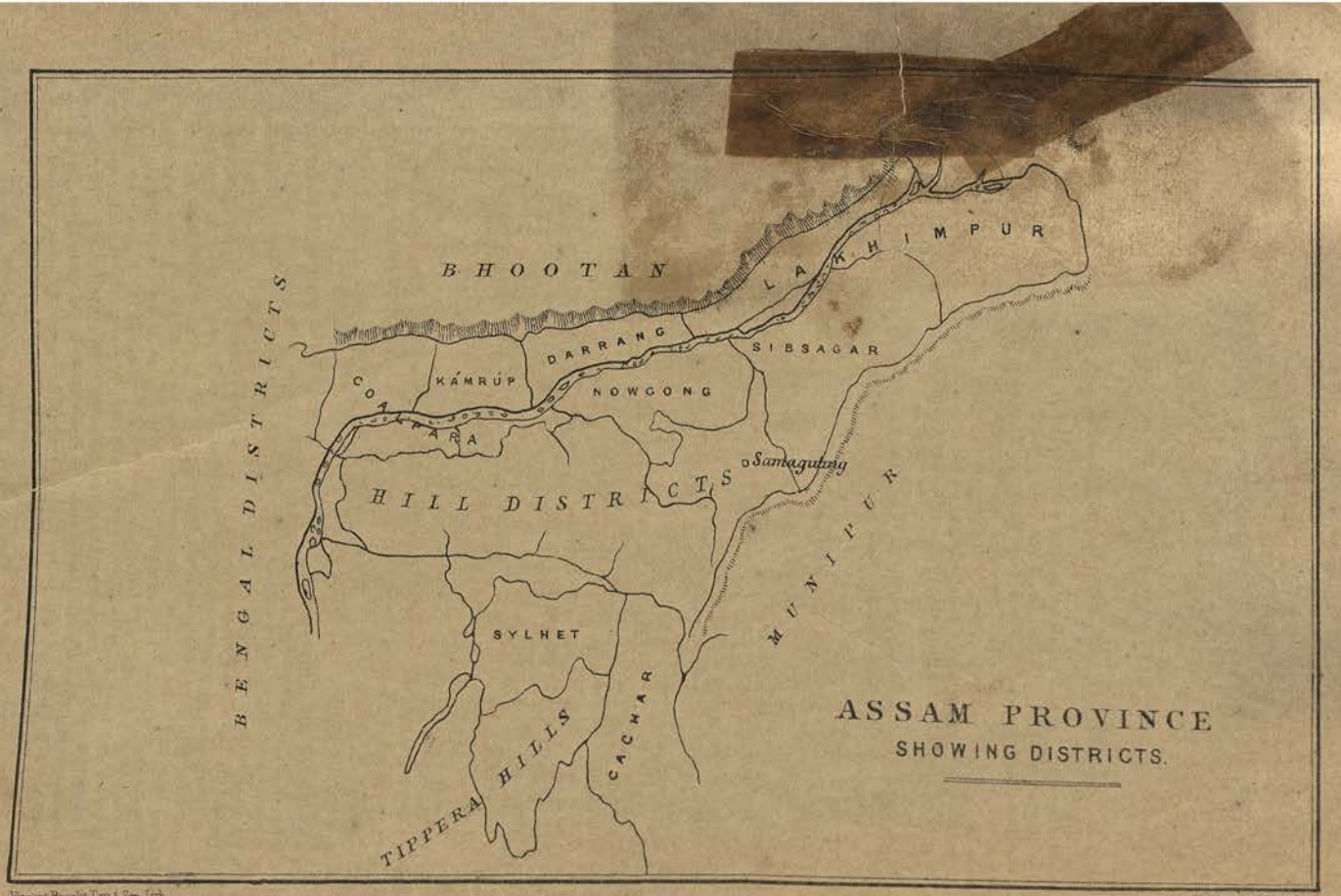
In the next triennial cycle, 1878-80, the returns show the normal course in the prevalence of cholera to have been again interrupted by an increased activity of the disease in 1879; and this was coincidently with famine distress in that year over very wide areas of the province. But in 1880, the last year of the cycle, the disease fell, in the normal course, to a minimum of prevalence. The death-rates for the three years of the cycle are shown by the returns to be a more close approximation to the rates obtaining in the years preceding the famine of 1873-74 than to those prevailing in the years immediately following the famine; and in the last of the three years of the cycle the prevalence of the disease subsided to a minimum normal to that year of the triennial period. The death-rates for the first, second, and third years of the cycle are respectively 1.58, 2.27, and 0.66 per mille of population.

In 1881, the first year of the next cycle ending with 1883, the returns show the cholera of the year to have prevailed with revived activity in the normal course for that year of the cycle, the death-rate having risen from 0.66 per mille in the minimum year of the preceding cycle to 1.32 per mille in the normally maximum year of this cycle. Comparing the death-rates of the civil population under registration for the three successive triennial cycles from 1872 to 1880 inclusive with those of the troops and jail populations together during the same periods—although the rates of mortality among the two different sets of population differ very remarkably in degree, as the result of a more perfect and accurate registration in the one case than in the other—there is still observable a very strongly marked general correspondence in the results obtained in respect to the periodical increase and decrease of cholera activity in the successive years of the several cycles referred to; and this correspondence is mainly due to the incidence of the disease among the prisoners alone of the troops and jail populations—a class of men more immediately drawn from, and representing the prevalence of the disease among, the civil population.

Such are the main features disclosed by the returns regarding the cyclical prevalence of cholera in the Bengal Province, the reputed endemic area and natural home of the disease. The seasonal prevalence of cholera in each year of our series is shown in Table No. II. by the number of deaths registered in each of the twelve months. Taking the figures for the whole series of eleven years—1871 to 1881—for which the statistics are available, it appears that the periods of the spring and autumn equinoxes—the months of February and March, and those of September and October, respectively—are, as a rule, the seasons of minimum cholera prevalence; that the hot-weather rainy season—the months of June, July, August, and part of September—is the

period of its generally suppressed activity; and that the seasons immediately following the spring and autumn equinoxes—the months respectively of April, May, and June partly, and of November, December, and January partly—are the periods of its prevalence in greatest intensity. This seasonal rise and fall in the prevalence of cholera in the Bengal Province as a whole is exhibited very clearly by the monthly figures in Table No. II. The intensity of the successive epidemics declines with the advancing years of each cycle, except when drought and famine interpose to disturb the regularity of this sequence, as is illustrated by the statistics of rainfall and food-supply furnished in Table No. V. An examination of these tabular statements shows that in the Bengal Province as a whole it is the rule for cholera to sink to a minimum of prevalence, or to subside into abeyance, regularly at the periods of the spring and autumn equinoxes—in the months of January and February or February and March in the one case, and of August and September or September and October in the other, apparently in accordance with the earliness or lateness of the seasons—and to rise into more or less activity and intensity of prevalence during the periods of the summer and winter solstices—the culminating points being reached in April and May in the former season, and in November or December in the latter—but with varying fluctations of rise and fall or persistent high prevalence during these seasons, apparently in accordance with the lesser or greater rainfall or its prolonged defect.

Comparing the cholera mortality with the rainfall in the province as a whole, it appears, as a rule, that light rainfall favours the activity of cholera, whilst heavy rainfall as regularly checks the activity of the disease. This is more especially the case in Bengal Proper. In the other divisions of the province there is considerable divergence from this rule, as has been already described in previous passages. Further, we find that seasons of drought, resulting in famine, greatly intensify and sometimes greatly prolong the ordinary seasonal prevalence of the disease.



Vincent Brooks, Day & Son, Lith.

Trübner & Co. London.

SECTION VII.

ASSAM PROVINCE.

Geographical Position.

THE province lies on the north-eastern border of Bengal, and forms the north-eastern frontier province of the Indian Empire. It comprises the valleys of the Brahmaputra and the Barák or Surmá, together with the mountainous watershed which intervenes between these two rivers. It is situated between 23° 58′ 30″ and 28° 17′ N. lat., and between 89° 46′ and 97° 5′ E. long. The divisions, districts, area, and population of the portions of the province under mortuary registration are shown in the annexed tabular statement. The seat of government of the province is at Shillong, in the Khasi Hills.

STATEMENT *showing Population, Area, and Density of Population in each District of the Assam Province for the Year 1872.*

Divisions.	Districts.	Population (Census 1872). Males.	Females.	Total.	Totals of Divisions.	Area in square miles. District.	Division.	Population per square mile. District.	Division.
Brahmaputra Valley	Goalpara	229,374	215,387	444,761	1,916,697	4,433	20,683	100	93
	Kamrup	292,688	268,993	561,681		3,631		155	
	Nowgong	133,107	123,283	256,390		3,648		70	
	Darrang	122,837	113,172	236,009		3,413		69	
	Sibsagar	154,940	141,649	296,589		2,413		123	
	Lakhimpur	64,692	56,575	121,267		3,145		39	
Surma Valley.	Sylhet	880,330	839,209	1,719,539	1,924,566	5,383	6,668	319	289
	Cachar	110,373	94,654	205,027		1,285		160	
Total of the province		1,988,341	1,852,922	3,841,263		27,351		140	

Physical Aspects.

The valley of the Brahmaputra, or Assam Proper, is an alluvial plain about 450 miles long, with an average breadth of 50 miles. It is shut in by jungle-covered ranges or lofty mountains on all sides but the west. The valley is traversed by the main stream of the Brahmaputra from east to west, and the strips of land on each bank of the river are traversed by numerous minor streams. The low land immediately beneath the river-banks, but above the dry-season level of the stream, is liable to annual inundation, and abandoned to a wild overgrowth of reeds or grass jungle. At about 6 miles from the river the ground begins to rise gradually towards the hills, and in this tract permanent cultivation becomes possible. The uniform level is broken at intervals by low conical hills, which are scattered in isolated mounds or in clusters throughout the plains. In some parts, also, the southern hills throw forward spurs running down almost to the river-bank. The Surma Valley reproduces the same phenomena on a small scale. The district of Cachar is crowned by hill-ranges running transversely to the main river, and in Sylhet the valley gradually expands until it merges into the wide expanse of Eastern Bengal. The central hill-tract, comprising the districts of the Naga, Khasi, and Jaintia,

and Garo Hills, forms a long projection of the mountain system that intervenes between the watersheds of the Brahmaputra and the Irrawaddy, and consists of a large number of ridges and plateaux running for the most part parallel to one another, and separated by deep valleys. The highest elevation is in the neighbourhood of Samaguting, in the Naga Hills, about 10,000 feet above sea-level; the range in the Khasi Hills, above Shillong, rises to 6449 feet.; while the Garo Hills have no point higher than 4700 feet.

The soil of the Brahmaputra Valley is for the most part a rich black loam, reposing on gray sandy clay, but in some tracts a light-yellow clay appears on the surface. The mountains on the north and east are of igneous formation, being composed of primitive limestone, granite, serpentine, porphyry, and talcose slate. The Mishmi Hills, closing the north-eastern frontier, are of limestone. The Naga Hills begin on the east with sandstone; but in the neighbourhood of Samaguting granite appears, which runs westward continuously to the end of the Garo ranges. In the Khasi and Jaintia Hills stratified rocks of sandstone, limestone, and shale occur; and talc in the Garo Hills. Over the greater part of the hill-tracts the surface soil is a red ferruginous clay. The hills are well covered with forest trees. Rice is the staple crop in all parts of the province; in the Brahmaputra and Surma Valleys three crops are grown in the year.

The tea industry in this province is one of its most important economic features in connection with the prevalence of cholera, owing to the large number of coolies annually imported from Bengal for labour in the tea plantations.

The climate of this province, both in the Brahmaputra and Surma Valleys, is noted for its excessive humidity. The rainy season begins about March and lasts till the middle of October. In the Brahmaputra Valley the morning fog is a special characteristic of the cold weather. It rises from the river at daybreak, and often does not clear away till nearly mid-day. The prevalent direction of the wind in both valleys is from the north-east. The average rainfall of the five years ending in 1876 varied from 159 inches in Sylhet to 60 inches in Kamrup. In the hill-tracts the rainfall is much heavier. At Cherapunji, in the Khasi Hills, the average of the three years ending in 1876 is 368 inches. The average mean temperature at Silchar is about 77° F., the range of variation being 32°. The climate of both valleys is notoriously malarious. The most prevalent diseases are intermittent fevers, bowel complaints, cholera, smallpox, &c. (Hunter's *Imperial Gazetteer.*)

Cholera History, Statistical and Descriptive.

In the annexed series of tabular statements, Nos. I. to VI., are exhibited, in uniformity with the corresponding tables furnished with the historical account of the disease in the other provinces of British India, the statistics of cholera mortality for the troops and jail populations, and, so far as available, for the civil population also, together with the rainfall records and prices of the staple food-grain during the period of twenty years dealt with in this inquiry.

No. I.—STATEMENT *showing the Annual Total Deaths Registered from Cholera among the Civil Population in each of the Districts of the Assam Province from the Year* 1871 *to* 1881 *inclusive.*

Districts.	Total Cholera Deaths Registered among the Civil Population in the Years										
	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Goalpara .	1,231	862	668	272	2,288	556	465	314	1,365	166	57
Kamrup .	1,793	2,026	2,201	5,905	1,430	964	1,746	1,167	4,086	320	1,719
Nowgong .	2,006	352	168	3,106	301	720	2,502	455	3,059	538	730
Darrang . .	422	508	590	2,997	660	362	2,200	727	4,148	59	231
Sibsagar . .	338	3,074	527	337	777	3,919	578	1,665	970	490	759
Lakhimpur .	...	94	377	855	22	186	324	753	181	262	53
Sylhet . .	39	524	933	2,763	160	1,773	2,934	1,320	3,535	732	1,456
Cachar . .	44	782	194	219	980	135	628	331	71	236	5

NOTE.—In the Khasi Hills there were registered cholera deaths—3 in 1872, 33 in 1873, and 24 in 1874, which are not included in the above statement, but appear in the returns of Table No. II.

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Assam Province for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	Cholera Deaths Registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches and Cents.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera prevalent over the province generally.															No information.	126·44
1863	Cholera widely prevalent over the whole area of the province.																125·55
1864	Cholera declining, though still prevalent in both valley divisions of province.																134·46
1865	Cholera widely diffused. The Bhootan Field Force suffered severely.																141·77
1866	Cholera generally prevalent in both river valleys of the province.																133·68
1867	Cholera widely diffused, as in preceding year.																126·55
1868	Cholera generally in abated prevalence throughout the province.																141·26
1869	Cholera severely epidemic over the province generally.																151·70
1870	Cholera widely prevalent, but epidemic activity declining.																137·54
1871	9	9	2	39	146	219	501	337	610	1,111	1,117	1,773	?	?	5,873	1·42	126·85
1872	990	375	330	734	719	743	463	255	113	401	1,679	1,423	4,385	3,843	8,225	2·10	156·29
1873	515	157	96	330	1,032	1,303	1,199	425	277	161	67	129	3,152	2,539	5,691	1·40	103·59
1874	182	237	299	412	2,262	3,613	2,512	1,291	928	976	2,024	1,742	8,780	7,698	16,478	3·99	141·70
1875	No returns published for this year.														6,618	1·74	137·61
1876	820	798	1,245	1,588	1,193	1,017	747	487	196	170	111	243	4,700	3,915	8,615	2·20	136·62
1877	391	370	263	834	2,426	2,852	1,717	535	168	302	628	891	6,311	5,066	11,377	2·90	126·18
1878	367	281	424	614	1,043	930	734	281	112	320	574	1,052	3,732	3,000	6,732	1·70	156·66
1879	986	660	2,116	6,018	4,404	1,762	712	188	110	120	79	260	9,627	7,788	17,415	4·59	151·26
1880	259	333	266	296	239	223	70	21	39	216	386	455	1,589	1,214	2,803	0·74	149·39
1881	570	151	183	356	289	414	493	470	331	490	659	594	2,714	2,296	5,010	1·12	140·03
Means	5,089	3,371	5,224	11,221	13,753	13,076	9,148	4,290	2,884	4,267	7,324	8,562	44,990	37,359	94,837	2·24	137·25

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the Assam Province in Inches and Cents. for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	RAINFALL IN INCHES AND CENTS. IN THE MONTHS OF												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	0·27	2·38	3·22	7·85	10·16	25·50	28·29	25·63	13·72	8·95	0·44	0·03	126·44
1863	0·29	0·77	0·84	8·75	15·73	27·91	26·09	23·18	18·07	3·40	0·48	0·04	125·55
1864	0·43	3·67	3·57	10·00	11·36	28·21	33·73	21·76	14·26	5·78	0·97	0·72	134·46
1865	0·25	1·05	1·44	9·08	18·12	34·51	42·26	20·32	9·66	3·37	0·70	1·01	141·77
1866	1·11	3·62	3·80	7·96	12·83	30·63	27·96	21·87	16·34	7·21	0·23	0·12	133·68
1867	1·12	1·48	5·20	8·65	11·06	27·14	33·30	18·11	13·01	5·00	2·42	0·06	126·55
1868	0·32	3·40	2·03	10·29	8·50	31·41	35·23	24·53	21·80	3·16	0·37	0·22	141·26
1869	2·12	2·29	3·30	12·06	24·68	26·39	32·11	22·42	19·85	5·64	0·71	0·13	151·70
1870	0·11	1·82	3·17	7·83	15·17	36·47	25·76	19·87	20·46	6·29	0·57	0·02	137·54
1871	0·11	1·34	3·72	11·37	14·82	21·44	24·81	25·07	14·65	8·05	1·31	0·16	126·85
1872	1·02	1·39	5·53	13·14	16·74	28·22	32·41	21·66	28·27	7·34	0·41	0·16	156·29
1873	0·52	1·91	5·15	8·50	8·02	26·37	23·73	16·71	10·52	1·83	0·15	0·18	103·59
1874	1·19	3·17	6·00	11·93	28·76	20·43	26·58	18·77	17·50	6·95	0·39	0·03	141·70
1875	1·97	0·79	6·37	16·79	10·82	36·40	25·12	28·00	8·82	1·63	0·43	0·47	137·61
1876	0·69	1·00	6·76	9·22	18·10	38·47	25·22	19·38	10·14	6·56	1·04	0·03	136·62
1877	1·26	1·64	5·84	6·84	16·71	16·62	28·94	15·23	28·09	2·86	1·09	1·06	126·18
1878	0·59	1·93	4·11	9·89	13·44	29·20	34·29	30·57	24·99	5·12	2·40	0·13	156·66
1879	0·35	0·57	1·31	5·87	25·42	35·22	34·15	25·58	16·43	5·60	0·07	0·69	151·26
1880	1·48	2·11	14·96	15·38	10·04	36·91	26·92	25·13	8·78	5·78	0·44	1·46	149·39
1881	0·10	0·77	4·43	14·48	17·83	27·86	20·70	24·58	25·42	3·03	0·70	0·13	140·03
Means	0·76	1·85	4·53	10·29	15·41	29·26	29·38	22·41	17·03	5·17	0·76	0·34	137·26

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the Assam Province, together with the Average Strength and Ratio of Admissions and Deaths per Mille of Strength, for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Totals.			Ratio per Mille of Strength.	
	Strength.	Cholera.		Strength.	Cholera.		Strength.	Cholera.		Strength.	Cholera.		Admissions.	Deaths.
		Admissions.	Deaths.		Admissions.	Deaths.		Admissions.	Deaths.		Admissions.	Deaths.		
1862	51	1	1	4,379	31	19	1,510	81	49	5,940	113	60	19·02	10·10
1863				3,341	20	6	1,460	66	39	4,801	86	45	15·83	9·37
1864				4,502	31	17	1,427	37	11	5,929	68	28	11·46	4·72
1865				6,740	206	122	1,383	78	47	8,123	284	169	34·96	20·80
1866				7,281	21	7	1,442	40	18	8,723	61	25	6·99	2·86
1867				2,857	24	10	1,421	33	18	4,278	57	28	13·32	6·54
1868				2,175	17	2	1,344	10	3	3,519	27	5	7·67	1·42
1869				2,787	40	18	1,328	56	30	4,115	96	48	24·05	11·66
1870				2,733	13	5	1,289	5	3	4,022	18	8	4·47	1·99
1871				3,108	7	4	1,245	26	15	4,353	33	19	7·57	4·36
1872				2,600	24	12	1,185	14	7	3,785	38	19	10·02	5·02
1873				2,897	14	6	1,114	19	9	4,011	33	15	8·22	3·74
1874				3,255	45	31	1,173	20	11	4,428	65	42	14·67	9·45
1875				2,849	21	14	1,069	19	12	3,918	40	26	10·20	6·64
1876				2,963	10	5	1,392	1	1	4,355	11	6	2·50	1·38
1877				2,960	2	2	1,283	15	14	4,243	17	16	4·02	3·77
1878				3,043	6	4	1,188	8	5	4,231	14	9	3·33	2·13
1879				2,108	18	11	1,282	34	12	3,390	52	23	15·31	6·78
1880				3,598	17	12	1,258	1	1	4,856	18	13	3·70	2·68
1881				3,812	1	1	1,306	16	10	5,118	17	11	3·30	2·15

No European troops in the province in these years.

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the Assam Province for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	51	51	1·96	100	4,379	3,368	0·92	32	1,510	1,137	7·12	60
1863					3,341	1,884	1·06	30	1,460	1,194	5·53	59
1864					4,502	3,985	0·78	55	1,427	638	5·80	30
1865					6,740	6,740	3·06	59	1,383	1,259	6·19	60
1866					7,281	2,070	1·01	33	1,442	1,338	2·99	45
1867					2,857	2,499	0·96	42	1,421	532	6·20	54
1868					2,175	1,864	0·91	12	1,344	571	1·75	30
1869					2,787	2,787	1·43	45	1,328	1,066	5·25	53
1870					2,733	2,407	0·54	38	1,289	846	0·59	60
1871					3,108	1,591	0·44	57	1,245	546	4·76	58
1872					2,600	2,404	1·00	50	1,185	451	3·10	50
1873					2,897	2,148	0·65	43	1,114	852	2·23	47
1874					3,255	3,255	1·38	69	1,173	1,019	1·96	55
1875					2,849	2,785	0·75	67	1,069	500	3·80	63
1876					2,963	1,552	0·64	50	1,392	64	1·56	100
1877					2,960	1,428	0·14	100	1,283	680	2·20	93
1878					3,043	2,048	0·29	67	1,188	203	3·94	62
1879					2,108	2,108	0·85	61	1,282	534	6·37	35
1880					3,598	1,878	0·90	70	1,258	287	0·35	100
1881					3,812	905	0·11	100	1,306	305	5·24	62

No European troops in the province during these years.

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera as represented by the Death-rates registered among the Troops and Jail Populations, and among the Civil Population, of the Assam Province for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Rice.*

Years.	Cholera Death-rate per Mille of Strength or of Population.					Average Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Cents per Rupee.
	European Troops.	Native Troops	Jail Populations.	Total of Troops and Jails.	Civil Populations.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	19·61	2·28	32·45	10·10		126·44	5·87	43·51	67·64	9·42	27·97
1863		1·79	26·71	9·37		125·55	1·90	52·39	67·34	3·92	26·01
1864		3·78	7·71	4·72		134·46	7·67	49·57	69·45	7·47	22·57
1865		18·10	33·98	20·80		141·77	2·74	61·71	72·24	5·08	15·74
1866		0·96	12·48	2·86		133·68	8·53	51.42	66·17	7·56	13·29
1867		3·50	12·67	6·54		126·55	7·80	46·85	64·42	7·48	17·84
1868		0·92	2·23	1·42		141·26	5·75	50·20	81·56	3·75	22·89
1869		6·46	22·59	11·66		151·70	7·71	63·13	74·38	6·48	12·56
1870		1·83	2·33	1·99		137·54	5·10	59·47	66·09	6·88	18·77
1871		1·29	12·05	4·36	1·42	126·85	5·17	47·63	64·53	9·52	19·25
1872		4·61	5·91	5·02	2·10	156·29	7·94	58·10	82·34	7·91	23·92
1873		2·07	8·08	3·74	1·40	103·59	7·58	42·89	50·96	2·16	22·18
1874		9·52	9·38	9·45	3·99	141·70	10·36	61·12	62·85	7 37	13·85
1875		4·91	11·22	6·64	1·74	137·61	9·13	64·01	61·94	2·53	15·80
1876		1·69	0·72	1·38	2·20	136·62	8·45	65·79	54·74	7·63	14·91
1877		0·67	10·91	3·77	2·90	126·18	8·74	40·17	72·26	5·01	13·62
1878		1·31	4·21	2·13	1·70	156·66	6·63	52·53	89·85	7·65	9·03
1879		5·22	9·36	6·78	4·59	151·26	2·23	66·51	76·16	6·36	14·70
1880		3·33	0·79	2·68	0·74	149·39	18·55	62·33	60·83	7·68	20·00
1881		0·26	7·65	2·15	1·30	140·03	5·30	60·17	70·70	3·86	23·20

No European troops in the province in these years.

No Information.

No. VI.—STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the Assam Province for the Twenty Years* 1862 1881.

Years.	DISTRICTS AND STATIONS.								
	Goalpara. Ditto.	Kamrup. Gauhati.	Nowgong. Ditto.	Darrang. Tezpur.	Sibsagar. Ditto.	Lakhimpur. Dibrugarh.	Sylhet. Ditto.	Cachar. Silchar.'	Khasi Hills. Cherapunji.
1862	99·00	62·35	93·10	74·30	108·50	115·33	46·63?	107·57	431·26
1863	99·00	64·19	43·30	69·80	99·00	115·33	130·42	65·25	443·68
1864	99·00	40·97	47·50	63·60	121·70	115·33	136·10	97·80	488·12
1865	99·00	48·22	50·50	76·70	75·90	115·33	147·40	158·83	504·10
1866	99·00	74·27	92·50	97·00	72·20	115·33	94·75	188·22	369·86
1867	99·00	74·89	92·70	83·20	81·70	115·33	126·60	114·92	350·60
1868	87·00	36·00	98·20	54·98	108·90	115·33	129·57	112·00	529·44
1869	85·64	64·03	87·50	66·72	106·90	115·33	178·55	101·79	558·82
1870	128·33	69·79	77·80	89·73	98·61	126·15	161·38	107·26	378·86
1871	88·96	56·02	126·81	83·49	121·07	108·25	144·08	92·48	320·55
1872	105·14	79·09	133·07	73·50	103·67	112·18	197·70	124·44	477·83
1873	68·33	50·01	70·61	65·89	73·27	91·00	126·79	103·36	283·00
1874	106·93	58·41	79·76	79·28	126·25	138·99	143·94	119·20	422·55
1875	97·57	54·88	69·59	84·03	103·28	104·29	183·79	132·53	408·58
1876	87·89	65·83	62·99	58·18	83·73	107·97	152·02	141·62	469·35
1877	80·30	57·21	54·91	72·73	92·62	109·00	158·38	128·03	382·40
1878	142·82	68·12	72·84	82·01	85·57	115·69	165·17	125·85	551·94
1879	109·63	79·09	94·02	92·77	106·14	118·93	160·22	113·50	487·12
1880	113·76	70·07	68·53	79·50	99·06	120·09	173·77	111·46	508·32
1881	91·10	72·12	79·96	96·61	95·32	116·28	166·33	126·95	415·61

NOTE.—The rainfall of Goalpara from 1862 to 1867 is the average of the five years from 1868 to 1872; of Dibrugarh from 1862 to 1869, the average of the five years 1870 to 1874; of Silchar for 1862, the average of the five years 1868 to 1872; and of Cherapunji for 1862, the average of the five years 1863 to 1867.

I now proceed to give the history of cholera in the Assam Province, as far as is to be gathered from the records of each year.

1862.—For this year and the next eight years ending 1870 there is no statistical information available regarding the prevalence of cholera among the civil population of the Assam Province. For this period the records of the incidence of the disease among the troops and jail populations furnish our only guide to the severity or otherwise of the prevalence of cholera among the general population of the province; and these records are derived from the medical statistics of the troops and jails in the province as given in Bryden's Tables of Cholera.

The incidence of the cholera of 1862 among the troops and jails in the Assam Province was as follows:—

Among the European troops, total average strength 51, there was 1 admission and 1 death from cholera, viz., at Dibrugarh, strength 51, in May, giving a death-rate of 19.61 per mille of strength.

Among the Native troops, total average strength 4379, there were altogether 31 admissions and 10 deaths from cholera, giving a death-rate of 2.28 per mille of strength. Of the 6 stations occupied by these troops, the 5 following recorded cholera in 1862, viz.:—Sylhet, strength 564, admissions 4 and deaths 0; Cherapunji, 811, 2 and 2; Gauhati and Lower Assam, 1360, 14 and 5; and Upper Assam, 633, 11 and 3 respectively. Of the 31 admissions, there were 3 in February, 3 in March, 9 in May, 4 in June, 1 in July, 4 in August, 2 in September, 2 in October, 1 in November, and 2 in December.

Among the jail populations, total average strength 1510, there were altogether 81 admissions and 49 deaths from cholera, giving a death-rate of 32.45 per mille of strength. Of the 9 jails in the province, the 5 following returned cholera in 1862, viz. :—Sylhet, strength 435, admissions 46 and deaths 27; Cachar, 166, 9 and 6; Goalpara, 199, 10 and 5; Gauhati, 159, 4 and 4; and Dibrugarh, 178, 12 and 7 respectively. Of the 81 admissions, there were 2 in March, 16 in April, 44 in May, 6 in June, 1 in July, 4 in August, 1 in November, and 7 in December.

From the severity of the disease in the jails and among the Native troops, the cholera of 1862 would appear to have been widely diffused and epidemically prevalent in a large portion of the area of this province.

The rainfall of the year was considerably in defect, about 11¼ inches less than the average fall for the twenty years of our series, of which 1862 is the first. The price of food, however, appears to have been very cheap, the average price of rice being 27.97 sers the rupee, a more favourable rate than obtained in any subsequent year of our series.

1863.—In this year the returns show that cholera was about as prevalent as in the year before, the death-rate among the troops and jails together being 9.37 per mille of strength against 10.10 per mille in 1862. From this year inclusive forwards there were no European troops quartered in this province.

Among the Native troops, total average strength 3341, there were altogether 20 admissions and 6 deaths from cholera, giving a death-rate of 1.79 per mille of strength against 2.28 per mille in the year before. Of the 5 stations occupied by these troops, the 3 following recorded cholera in 1863, viz.:—Cherapunji, strength 576, admissions 10 and deaths 2; Jawaie, 647, 1 and 1; and Gauhati, 661, 9 and 3 respectively. Of the 20 admissions, there were 2 in April, 2 in May, 3 in June, 2 in July, 4 in August, 2 in September, 2 in October, and 2 in November.

Among the jail populations, total average strength 1460, there were altogether 66 admissions and 39 deaths from cholera, giving a death-rate of 26.71 per mille against 32.45 in the year before. Of the 9 jails in the province, the 7 following recorded cholera in 1863, viz. :—Sylhet, strength 411, admissions 16 and deaths 7; Cherapunji, 23, 9 and 7; Cachar, 190, 9 and 5; Goalpara, 174, 6 and 2; Gauhati, 148, 16 and 12; Nowgong, 90, 9 and 5; and Tezpur, 178, 1 and 1 respectively. Of the 66 admissions, there were 2 in January, 6 in March, 14 in April, 6 in May, 14 in June, 6 in July, 16 in August, 1 in September, and 1 in October.

These returns show cholera to have been generally prevalent all through the year, and to have been widely diffused over the area of the province. The rainfall of the year was still in defect, being somewhat less than that of the year before; it was also differently distributed as to the season of its fall, the quantity falling in the second quarter of the year being much greater than that of the corresponding period in the preceding year, and the falls in the first and last quarters being much less than in those periods of the preceding year, whilst the fall in the third quarter was about the same in both years (see Table No. V.) The price of food in 1863 was still very cheap, though less so than in the preceding year.

1864.—There was a marked abatement in the activity of the cholera of this year in the Assam Province, judged by the decline in the death-rate from the disease among the troops and jail populations. For these two classes, taken together, the death-rate fell to 4.72 per mille of strength against 9.37 in the preceding year.

Among the Native troops, total average strength 4502, there were altogether 31 admissions and 17 deaths from cholera, giving a death-rate of 3.78 per mille of strength. Of the 8 stations occupied by these troops, exclusive of the Bhootan Field Force during November and December, the 5 following recorded cholera in 1864, viz.:—Cherapunji, strength 412, admissions 1 and deaths 0; Sylhet, 455, 13 and 10; Goalpara, 188, 2 and 2; Gauhati, 361, 5 and 2; and Dibrugarh, 647, 3 and 0 respectively. In the Bhootan Field Force, strength 1922, there were 7 admissions and 3 deaths. Of the 31 admissions, there were 10 in March, 4 in April, 1 in May, 3 in June, 1 in July, 1 in August, 1 in October, 5 in November, and 2 in December. The admissions in November and December occurred entirely in the Bhootan Field Force.

Among the jail populations, total average strength 1427, there were altogether 37 admissions and 11 deaths from cholera, giving a death-rate of 7.71 per mille of strength. Of the 9 jails in the province, the 4 following recorded cholera in 1864, viz.:—Cachar, strength 211, admissions 10 and deaths 7; Goalpara, 149, 23 and 2; Gauhati, 153, 3 and 2; and Dibrugarh, 125, 1 and 0 respectively. Of the 37 admissions, there were 3 in April, 4 in May, 12 in June, 6 in July, 3 in August, 1 in September, and 8 in November.

The returns show the disease to have been active nearly throughout the year, but that fewer of the stations recorded cholera than in the two years preceding. The rainfall of 1864 was much more abundant than that of either 1863 or 1862, and was but little short of the average fall for the province; it was also seasonably distributed in due proportion. Notwithstanding the favourable rainfall of the year, however, there was a steadily continuous rise in the price of food; the average price of rice in 1864 rose to 22.67 sers the rupee against 26.01 sers in 1863 and 27.97 sers in 1862.

1865.—In this year, contrary to the normal course for the disease in the third year of the triennial cycle 1863–65, cholera prevailed with altogether exceptional intensity, this unusually aggravated severity of the disease being coincident with excessive rainfall and famine rates for food. The death-rate from cholera among the troops and jail populations together in 1865 rose to the exceptionally high figure of 20.80 per mille of strength (see Table No. V.) against 4.72 per mille in the preceding year.

Among the Native troops, total average strength 6740, there were altogether 206 admissions and 122 deaths from cholera, giving a death-rate of 18.10 per mille of strength. The following stations recorded the disease in 1865, viz.:—Cherapunji, strength 448, admissions 2 and deaths 0; Sylhet, 551, 6 and 5; Nowgong, 88, 2 and 2; and Dibrugarh, 569, 5 and 2 respectively. In the Bhootan Field Force, strength 5084, there were 191 admissions and 113 deaths from cholera. Of the 206 admissions, there were 57 in April, 70 in May, 42 in June, 5 in July, 1 in August, 4 in September, 1 in October, 21 in November, and 5 in December.

Among the jail populations, total average strength 1383, there were altogether 78 admissions and 47 deaths from cholera, giving a death-rate of 33.98 per mille of strength. The following 6 jails recorded the disease in 1865, viz.:—Sylhet, strength 403, admissions 3 and deaths 3; Cachar, 226, 35 and 24; Goalpara, 140, 3 and 0; Gauhati, 154, 20 and 11; Tezpur, 214, 15 and 9; and Dibrugarh, 122, 2 and 0 respectively. Of the 78 admissions, there were 4 in March, 23 in April, 11 in May, 6 in June, 2 in July, 1 in August, 21 in October, and 10 in November.

Among the Native troops of the Bhootan Field Force the sickness and

mortality were excessive. The force assembled in November and December 1864. In the former month the strength of the Native troops was 1349, and in the latter 2528. During these two months the total of admissions into hospital from all causes was 513, and the total of deaths 6; and out of these totals there were 7 admissions and 3 deaths from cholera, 241 admissions and 1 death from fever, 101 admissions and no death from dysentery, and 24 admissions and no death from diarrhœa. The remaining 114 admissions were from all other causes, including 68 admissions and 2 deaths from wounds and accidents.

During the year 1865 the average strength of the force was 5084 for the first ten months of the year, and 5460 during the last two months. The daily average number of sick was no less than 699, "or at the rate of 13.75 per cent.; while the deaths amounted to 480, or 94.41 per 1000." Of the deaths, 113 were from cholera, viz., 1 in February, 4 in March, 37 in April, 33 in May, 22 in June, 5 in July, 1 in August, and 10 in November. The deaths during the year from fevers were 102, of which number 84 occurred in the months from April to September inclusive; from dysentery there were altogether 87 deaths, of which number 62 occurred in the months from April to September; from diarrhœa there were altogether 46 deaths, of which number 30 occurred in the same period above defined; the remaining 132 deaths were from all other causes, including 38 from wounds and accidents, and 42 from scurvy. The mortality from cholera was at the rate of 22.23 per mille of strength; from fevers, 20.06; and from dysentery and diarrhœa, 26.16; from scurvy it was at the rate of 8.26 per mille, and from wounds and accidents, 7.47. The total of admissions from cholera was 191, or at the rate of 3.76 per cent. of strength; and the percentage of deaths to admissions was 59.16. Of the cholera admissions, there were 56 in April, 67 in May, 36 in June, 5 in July, 1 in August, 4 in September, 20 in November, and 2 in December.

The force was broken up in March 1866, and during the months of January and February there was no cholera in it. During these two months, however, average strength of the native troops 6852, there were 733 admissions and 10 deaths from fevers, 394 admissions and 16 deaths from dysentery, and 127 admissions and 3 deaths from diarrhœa; from all other causes there were 956 admissions and 13 deaths, including 95 and 3 respectively from scurvy, and 103 and 2 respectively from wounds and accidents.

The returns of the incidence of the cholera of 1865 among the troops and jails indicate a very greatly increased prevalence of the disease as compared with the experience of the preceding year. A large proportion of the recorded mortality was contributed by the troops of the Bhootan Field Force; but still the jail returns show a very greatly increased prevalence of cholera in this year among the prisoners, especially as compared with the results of the preceding year; and this may be taken as an indication of a corresponding increase in the prevalence of the disease among the civil population of the province generally, from amongst whom the jails are filled. The cholera death-rate among the jail populations in 1865 was the highest of any year in our series, exceeding even that of 1862 (see Table No. V.); and this aggravated mortality was doubtless to some extent attributable to the very unfavourable conditions of the year in respect to weather and the food-supply.

The rainfall of 1865 was very abundant, being more than 7¼ inches above that of the preceding year, and about 4½ inches above that of the average annual fall for the province. It was also unevenly distributed

according to seasons, the falls in the second and third quarters of the year being unusually heavy, and those for the first and last quarters being unusually light. The south-west monsoon rains of this year were, in fact, unusually early, copious, and prolonged. The price of food, also, in this year was excessively high, and verged upon actual famine; the average price of rice in 1865 rose to 15.74 sers the rupee from 22.57 sers in the year before.

1866.—Cholera in this year subsided into comparatively complete quiescence. The death-rate from the disease among the troops and jail populations together sank to 2.86 per mille of strength from 20.80 in the year before. This marked abatement in the prevalence of the disease was coincident with a season of relatively deficient rainfall and a period of absolute famine distress. In the normal course, as observed in other provinces of India, cholera was due in this year—the first of the triennial cycle 1866–68—as a cholera of revived epidemic activity, but this it appears not to have been.

Among the Native troops, total average strength 7281, there were altogether 21 admissions and 7 deaths from cholera, giving a death-rate of 0.96 per mille of strength against 18.10 in the year before. Of the 9 stations occupied by these troops, the 4 following recorded cholera in 1866, viz.:—Shillong, 5 admissions and 1 death; Gauhati, 2 and 1; Dibrugarh, 13 and 6; and Tezpur 1 and 0 respectively. Of the 21 admissions, there were 1 in February, 4 in May, 9 in June, 3 in July, 3 in August, and 1 in September.

Among the jail populations, total average strength 1442, there were altogether 40 admissions and 18 deaths from cholera, giving a death-rate of 12.48 per mille of strength against 33.98 in the preceding year. Of the 9 jails in the province, the 7 following recorded cholera in 1866, viz.:—Sylhet, strength 394, admissions 10 and deaths 4; Cachar, 216, 9 and 6; Goalpara, 136, 9 and 3; Gauhati, 225, 5 and 2; Sibsagar, 101, 1 and 1; Tezpur, 170, 1 and 0; and Dibrugarh, 96, 5 and 2 respectively. Of the 40 admissions, there were 1 in January, 11 in February, 3 in March, 16 in April, 2 in May, 4 in June, 2 in July, and 1 in December.

The cholera of 1866, though very greatly less prevalent than in the preceding year, appears to have been more widely diffused. In the earlier months of the year the disease, as shown by the returns, was mainly prevalent among the jail populations, and during the middle months of the year among the troops; thus among the troops all the admissions, excepting 2, were in the months from May to August inclusive, whilst among the jail populations 33 of the 40 admissions were in the months from January to May inclusive.

The rainfall of 1866 was considerably less than that of 1865 (about 8 inches), and it was less, also, by about 3½ inches than the average annual fall for the province. The defect occurred in the second and third quarters of the year, the falls in the first and last quarters being unusually abundant (see Table No. V.) The price of food in 1866 was at famine rates, the average price of rice being 13.29 sers the rupee against 15.74 sers in the preceding year.

1867.—In this year the returns for the Native troops and jail populations show a very marked increase in the prevalence of cholera, the death-rate from that cause among these classes taken together having risen to 6.54 per mille of strength from 2.86 in the preceding year. This increased prevalence of cholera in the Assam Province in 1867 was coincident with a season of drought and high prices for food. In the normal course for this year—the

second of the triennial cycle 1866–68—the disease was due as an abating cholera.

Among the Native troops, total average strength 2857, there were altogether 24 admissions and 10 deaths from cholera, giving a death-rate of 3.50 per mille of strength against 0.96 in the year preceding. Of the 7 stations occupied by these troops, the six following recorded cholera in 1867, viz. :—Cachar, strength 242, admissions 5 and deaths 2; Cherapunji and Shillong, 834, 2 and 1; Nowgong, 87, 1 and 1; Tezpur, 424, 8 and 3; and Dibrugarh, 912, 8 and 3 respectively. Of the 24 admissions, there were 1 in March, 8 in April, 5 in May, 1 in June, 1 in July, 2 in August, 1 in September, 2 in October, 1 in November, and 2 in December.

Among the jail populations, total average strength 1421, there were altogether 33 admissions and 18 deaths from cholera, giving a death-rate of 12.67 per mille of strength against 12.48 in the year before. Of the 9 jails in the province, the 4 following recorded cholera in 1867, viz. :—Cachar, strength 212, admissions 25 and deaths 16; Goalpara, 134, 1 and 1; Gauhati, 201, 6 and 1; and Dibrugarh, 85, 1 and 0 respectively. Of the 33 admissions, there were 22 in April, 5 in May, 1 in June, 2 in September, 2 in October, and 1 in November.

The rainfall of 1867 was markedly in defect, and the defect was limited to the falls due in the second and third quarters of the year (see Table No. V.), or the season of the south-west monsoon. The rainfall of the whole year was over 7 inches less than that of the preceding year, and more than 10½ inches less than the average annual fall for the province. In the prices of food there was a considerable improvement, but the average price of rice was still very high.

1868.—Cholera in this year, returning to the normal course for the year as the last of the triennial cycle, sank to a minimum of prevalence, the death-rate among the troops and jails together being only 1.99 per mille of strength against 6.54 in the year before. This remarkable subsidence of the disease was coincident with an abundant monsoon rainfall and cheap prices of food.

Among the Native troops, total average strength 2175, there were altogether 17 admissions and 2 deaths from cholera, giving a death-rate of 0.92 per mille of strength against 3.50 in the preceding year. Of the 7 stations occupied by these troops, the 4 following recorded cholera in 1868, viz. :—Nowgong, strength 87, admissions 2 and deaths 1; Shillong and Cherapunji, 890, 13 and 0; and Dibrugarh, 887, 2 and 1 respectively. Of the 17 admissions, there were 1 in May, 10 in June, 4 in July, and 2 in August.

Among the jail populations, total average strength 1344, there were altogether 10 admissions and 3 deaths from cholera, giving a death-rate of 2.23 per mille of strength against 12.67 in the preceding year. Of the 9 jails in the province, the 4 following recorded cholera in 1868, viz. :—Cachar, strength 181, admissions 5 and deaths 2; Goalpara, 137, 1 and 0; Tezpur, 170, 1 and 0; and Dibrugarh, 83, 3 and 1 respectively. Of the 10 admissions, there were 1 in May, 3 in July, 2 in October, and 4 in November.

The rainfall of 1868 was very abundant, being nearly 14¾ inches greater than that of the preceding year, and about 4 inches above the average fall for the province. The falls in the first and last quarters of the year were comparatively light, that of the second ordinary, but that of the third was unusually heavy. There was a continued improvement in the prices of food in this year, and rates were much cheaper than during the three preceding years. The average price of rice was 22.89 sers the rupee against 17.84 sers in the year before.

The incidence of the cholera of 1868 among the Native troops and jail populations in this province is markedly less than in the two preceding years, and extraordinarily so as compared with the experience of 1865, the corresponding year of the preceding triennial cycle, in which the prevalence of the disease was extraordinarily severe among the Native troops and jail populations. In both the triennial cycles 1863–65 and 1866–68 there is much divergence from the normal periodic rise and fall of cholera prevalence in each three-year period, but unfortunately there are no particulars available regarding this irregularity to enable us to determine the prime factors to which it is to be attributed. There is much evidence to show that in some way or other, not yet clearly defined, the periodic rise and fall in cholera prevalence is dependent upon meteorological influences, and also that to some extent these influences are controlled by the physical geography of the country, irrespective altogether of the aggravation of a prevailing epidemic by the accident of coincident famine distress.

Regarding the physical geography of Assam, the following account is taken from the Sanitary Report for the Assam Province for 1877, by Dr. De Renzy, the Sanitary Commissioner :—

The province of Assam comprises Assam Proper, or the valley of the Brahmaputra, on the north; the extensive districts of Sylhet and Cachar, or the valley of the Surma River, on the south; and the hill-tracts of the Naga, Garo, Jaintia, and Khasi Hills, which, intervening, separate the two river-valleys. The hill-tracts lying between them have a very small population, and, so far as sanitary matters are concerned, are under British control to only a very small extent. These hill-tracts, therefore, are left out of consideration in the following history of cholera in this province.

The valley of the Brahmaputra is of a horse-shoe shape, about 450 miles long, with an average width of about 50 miles. It is open towards the west, and closed in on the other sides by lofty mountains. The River Brahmaputra flows through its whole length from east to west, receiving countless tributary streams, which carry the drainage of the mountains bordering on either side. The low-lying tract in the vicinity of the river is subject to inundation to a distance of about 6 miles on either side of the stream. The valley is studded with numerous low conical hills, or flat-topped mounds, of considerable extent. These mounds, or plateaux, are the favourite sites for tea-culture; the low ground intervening between the plateaux is swampy, and suitable only for rice cultivation. "About one-fourth of the whole valley is subject to inundation every year, and a large portion of the remainder is in a semi-marshy state. About one-seventh of the area is under cultivation, tea or rice, and at least five-sevenths are a dense, impenetrable jungle, tenanted only by tigers, elephants, rhinoceros, and other wild animals."

The valley of the Surma consists of two portions, which differ greatly in their physical features. "The western portion comprises the district of Sylhet, and is for the most part a large alluvial plain, averaging some 70 miles in width, with clusters of low sandy hillocks scattered here and there. It is traversed by numerous streams and watercourses, whose banks are in many cases somewhat more elevated than the surrounding country. During the rainy months, that is, from June to October, the whole of the district, with the exception of the hillocks and the villages built on the elevated banks of the rivers, or artificially raised, is submerged, and communication between villages is effected mostly by water. The eastern portion of the valley comprises the district of Cachar, and consists of low detached spurs, offshoots from the great Himalayan mountain-chains; and between the spurs lie rich alluvial valleys, which are to a great extent under water during the rains. Rather more than half the area of Sylhet and one-twentieth of that of Cachar are under cultivation."

The rainfall of the province is very heavy, and that at Cherapunji, on the southern face of the Khasi Hills, where, it is stated, it ranges from 450 to 700 inches in the year, is believed to be the heaviest in the world. The mean temperature, mean humidity, and rainfall of the meteorological registering stations are given as follows. The average meteorological elements of England for the twenty-five years ending 1873 are added as a standard for comparison :—

Stations.	Mean Temperature.	Mean Humidity.	Rainfall, 1877.
Goalpara—9 years . .	74·9	73·0	79·86
Sibsagar—4 ,, . . .	72·7	8·20	92·66
Cachar—8 ,, . . .	75·7	75·0	128·13
England	49·4	58·0	24·00

Vegetation in the Assam Province generally is exuberant; there is a large amount of rice and jute cultivation; and extensive tracts are covered by swamps and uncultivated lands, which "render the climate essentially malarious."

The following is taken from the description of the station of Sylhet by Dr. Mathew, the civil surgeon, and regarding which the Sanitary Commissioner, Dr. De Renzy, says that, with slight modifications, it would hold good for most of the stations in the province :—

The town limits comprise two distinct regions—the cleared and the uncleared. "The cleared portion is a tract along the banks of the river, about two miles long, and varying in breadth from a few yards at the western end to a fifth of a mile at the eastern. The latter, the broadest part of the strip, is occupied from east to west by the principal bazars, the courts, and European residences. The space allotted to the courts and European houses is open ground, intersected by roads, and containing so many tanks that it would scarcely be an exaggeration to say that it consists of more water than solid ground. Westwards the clear open narrows to a breadth little more than that of a road. Here is another bazar, a few houses formerly occupied by Europeans, all more or less dilapidated, and the houses of some boatbuilders and other native artizans on the banks of the river. The uncleared portion of the town, where the majority of the people live, lies directly behind, that is, to the north of the cleared portion, and may be roughly taken as being of the same length from east to west, with an average width or depth of 2 miles from the bank of the river to the town limits on the northern side. Over this extent are spread the numerous mohallahs of the town, all more or less enveloped in dense vegetation, so much so that if it were not for the temples and houses of brickwork of former days one meets here and there, he would fancy that he was looking at a virgin forest, into which the inhabitants had recently ventured. From the roadside a thatched roof or two peeping through the bamboo clumps is, perhaps, all that can be seen, but this may be one of forty or fifty houses half buried in jungle. The stagnation of air, the want of sunlight, the constant damp—what this condition of dwelling represents may be easily imagined. But there is worse than this. Almost every house has a water-hole (rising to the dimensions of a small tank near the bazar and older houses), the contents of which are too often foul water and weeds; and round and through most of the mohallahs is a chain of ditches and water-courses, intended, no doubt, to drain the ground on which the houses stand; but from want of an outlet or proper incline, these ditches are full to overflowing in the wet season, and at other times are choked with filth and decayed vegetation. The nearest cover represents the conservancy for the lower class, and though most of the better class of houses have privies of some kind, I am by no means certain that the primitive out-door arrangement is not less mischievous than such accumulations as most privies contain. The uncleared portion, as I describe it, of the town of Sylhet is not, it will be understood, all jungle. Breaks, occupied by tanks, marshes, or bits of cultivation, occur here and there, and occasional houses are outside the thickets, and stand on the sides of the roads; but certainly the general effect is, that the inhabitants have scooped out of the jungle a clear space just big enough for their houses, and afterwards encouraged the vegetation to close around them as thickly as possible."

The civil station of Silchar is thus described by Dr. De Renzy—

"Here an aggregate population of 4205 is scattered in detached groups over an area of 751 acres, or 5 per acre. In London the population is 40 per acre. But the station has other serious defects. The greater portion of it lies so low that it is under the hot-weather level of the Surma River, in consequence of which it is under water for several months in the year, and it would be quite impossible to drain it. Along the bank of the river there is an elevated piece of land of very limited extent. This is occupied by the courthouse, the church, and a portion of the native town. The European officers

and the better classes of natives have their houses on detached mounds, locally called tillahs, elevated a few feet above the undrainable swamps. The greater part of the native population reside in the swamp. By digging tanks or holes they have got a little earth, by means of which they have raised the floors of their miserable abodes above flood-level; but even in the driest weather their houses reek with damp."

The station of Dibrugarh, which is "the river port of the greatest tea-producing district in India," covers a very large area, and the population is sparsely scattered over it. There are three principal groups of population—one on the bank of a branch of the Dibru River, and two others at some distance in the rear. The site of the station generally is a level alluvial plain, which is well raised above the flood-level of the river, except on rare occasions of extraordinary rainfall. The drainage is provided for by open ditches, and as the rainfall is upwards of 120 inches a year, the ditches have to be very large in order to be capable of carrying off the water. Owing to the great extent of the station, an immense length of these open ditches is in a very unsatisfactory state; they have got silted up with mud, and stagnant pools of water are formed in the drains.

Regarding the villages in Assam, Dr. De Renzy writes:—

"I was agreeably surprised to find how clean and tidy the villages of the Sylhet district, on the Kohiara River, were. On the banks of that river, there is an almost unbroken succession of villages for 50 or 60 miles. The villages stood on high ground, having excellent natural drainage, and the houses and their immediate precincts were remarkably neat and clean, and well arranged in regular lines. The villages afforded unmistakable evidence that the people were comfortable and well to do. In the Assam valley the villages too often stand on low swampy sites, and there is no order in the arrangement of the houses, which present a damp, untidy appearance. Owing to the absence of a sweeper caste, the people in outlying places have adopted a very good plan of disposal of human excreta. They cover the excrement with earth. I was quite surprised at the small amount of excremental nuisance I found in Assam villages. In this respect they are far superior to the Punjab villages. Other kinds of filth abound in the vicinity of the huts."

1869.—In this year, the first of the new triennial cycle 1869–71, there was a very marked revival of cholera activity, and the disease caused a greatly increased mortality as compared with the preceding three years. This increased mortality was coincident with a season of very abundant rainfall and widespread distress from famine.

The rainfall of the year 1869 was very copious; it exceeded that of the preceding year by 10½ inches, and was 16½ inches above the average annual fall for the province. The greater portion of the excess fell in the second and third quarters, or during the season of the south-west monsoon. In the price of food there was a very great rise in 1869, and the cheap rates of the preceding year were again replaced by hard famine; the average price of rice in 1869 rose to 12.56 sers the rupee against 22.89 sers in 1868.

The following particulars regarding the history of the cholera of 1869 in the Assam Province are from the Report of the Sanitary Commissioner for Bengal for 1869–70:—

In Goalpara cholera is reported as endemic throughout the whole district; isolated cases occur every month. The disease is said to have prevailed epidemically on the left bank of the Brahmaputra River in the years 1841, 1846, 1853, 1857, and 1867, and on the right bank of the river in the years 1858 and 1868. In 1869 the Goalpara jail was affected. The subjoined statement shows the particulars of this visitation, and of the previous cholera outbreaks in this jail since the year 1853:—

Year.	Date of First Case.	Date of Last Case.	Cases.	Deaths.
1853	30th April	End of May	14	7
1857	26th December 1856	January 1857	23	12
1860	4th May	10th October	62	42
1864	4th April	September	25	2
1869	3d June	16th June	7	3

Though the jail was attacked in 1869, cholera, it is stated, was not in that year epidemic among the general population of Goalpara. In 1868 the disease prevailed most severely on the opposite or right bank of the river, particularly in the Gurla and Dubri portions of the district. The extent of mortality is not exactly known, though 9571 persons are said to have died. The epidemic began to subside shortly after the rains set in, and may be said to have ceased in the early part of August, though isolated cases continued to occur later in the different parts of the district. At Dubri and its neighbourhood cholera prevailed from October 1868 to the end of June 1869. "During the epidemic a large market was held every week at a small place called Singymari, which was frequented by people from infected villages; yet not a single case was reported as having occurred among the inhabitants of Singymari itself."

In Kamrup district cholera prevailed from February to July, but it never assumed a really epidemic form. The disease appeared to travel from west to east along the course of the river, which may be considered the great highway of Assam. In Upper Assam the disease raged violently, and caused great mortality. "In Gauhati it went from one part of the station to another in a most peculiar way. A few cases would occur in the west end, then suddenly stop, and the next cases would occur in the opposite direction." During the time the disease prevailed in the station only 3 cases occurred in the jail, of which 2 proved fatal. From the 24th April to the 9th July the police lost 7 men from cholera.

In the Darrang district cholera was rather severe in 1869, and a few cases occurred in the station of Tezpur from time to time during the prevalence of the disease in the district, where it commenced in the beginning of April. Up to the 23d April a total of 333 cases and 299 deaths had been reported. Some villages had been deserted by their inhabitants. "After a long drought, rains set in on the 14th April. The disease then somewhat abated." In the civil station of Tezpur there were 30 cases, with 19 deaths, from the 28th March to the 9th April. Among the police, 160 strong, there were 18 cases of cholera up to the 23d April. The jail and military lines were also affected by the disease.

In the Nowgong district cholera raged with much violence in 1869. Up to the 31st July the total of deaths from this cause was 6979. On the 21st September the disease was reported to have almost disappeared from the district. Cholera appeared in the jail on the 25th April, and caused 4 deaths.

The Sibsagar district was visited by epidemic cholera in 1869. The disease was prevalent in various parts of the district in February. The first case in the town of Sibsagar appeared on the 31st March, and proved fatal in a few hours. The victim was a Bengali who used to live in a native wine-shop near the bazar. "No other case occurred in the town till the 19th April, when a constable's wife, living close to the police station, was suddenly

attacked about 9 or 10 P.M., and carried off the next morning." After another interval the next case occurred on the 28th April in the bazar, and recovered under prompt treatment. From this time one or two cases began to occur every second or third day till the end of June, after which time no fresh cases were seen or heard of in the town. In the station of Sibsagar "the disease evidently broke out in several independent and distant centres at or about the same time, and seemed to have been of spontaneous origin, arising strictly from local causes, which give rise to cases of sporadic cholera at this season almost every year in Assam. Generally speaking the disease chiefly attacked the lowest classes of men, who were most ill-fed and badly located, and who lived in houses abounding in insanitary conditions. People of all castes, ages, and sex were almost equally affected by it." The total number of deaths from cholera reported throughout the district amounted to 623. The jail escaped entirely, and the police lost only one man from the disease. Both in this district and that of Nowgong "the cattle disease" was prevalent at the same time as the cholera.

Regarding the disease in the Dibrugarh district, the civil surgeon writes—"Cholera since 1861 has been almost endemic in the station or district; scarcely a week passes without one or more cases being recorded. For the past six years it has appeared in an epidemic form of greater or less severity in the months of May and June, and usually continues for six weeks. These epidemics are not general, being confined to localities of 4 or 5 miles in circumference, and do not spread generally throughout the district. In the latter half of May 1869 cholera appeared in an epidemic form in several parts of the district, and in the first week of June had extended to the station, and prevailed for the following six weeks." About 300 cases were reported, including choleraic diarrhœa cases, and less than 60 deaths. Both the jail and military lines were affected.

In order to discover whether the cholera that prevailed in Assam during 1869 "could be traced to infection spread by imported labourers disembarked from steamers on board which the disease had prevailed," the Chief Commissioner of the province "made special inquiry into the subject, the result of which went to prove that the appearance and spread of cholera in Assam are often, if not always, independent of importation by labourers from Bengal." In reporting on this subject, it is remarked by the Deputy Commissioner of Kamrup, "that there was an almost annual visitation of cholera to Assam in the months of April and May, before the importation of coolies was ever commenced." He also notices the fact "that although the disease had been supposed to be more severe in the neighbourhood of Nowgong than elsewhere, yet no trading steamers ever touched there." Epidemics occur, it is stated, "only at particular seasons," although very few of the steamers carrying coolies are ever free from cholera.

In the Khasi and Jaintia Hills a case or two of cholera had been reported near Jowai in April, but the disease did not spread. At Shillong the first case occurred on the 3d July, the second on the 11th, and the last on the 17th July; in all there were 24 cases, with 15 deaths. The rainfall during July this year was 11.92 inches against 14.0 in 1868 and 16.85 in 1867. The average temperature, 70°, was much the same as in other years. The average velocity of the wind was little more than 3 miles an hour. The mean humidity was 82 cents. Barometric mean, 25.031. "The low rate of velocity of the wind and the small fall of rain seem anomalous for July."

1870.—In this year there was a very marked abatement of cholera from that experienced in the preceding year. For the incidence of the disease

among the troops and jails see tabular statements Nos. III. and IV. at the head of this section. This very remarkable decline in the prevalence of cholera in 1870 was coincident with a rainfall slightly above the average, but 14 inches less than that of the preceding year, and with a great improvement in the prices of food, which, however, though much cheaper than the famine rates of 1869, were still very high.

Among the Native troops, total average strength 2733, there were altogether 13 admissions and 5 deaths from cholera, giving a death-rate of 1.83 per mille of strength against 6.46 in the year before. Of the 7 stations occupied by these troops, the 4 following recorded cholera in 1870, viz.:—Cachar, strength 319, admissions 1 and deaths 1; Shillong, 764, 1 and 0; Gauhati, 511, 10 and 4; and Upper Assam, 813, 1 and 0 respectively. Of the 13 admissions, there were 1 in January, 11 in May, and 1 in July.

Among the jail populations, total average strength 1289, there were altogether 5 admissions and 3 deaths from cholera, giving a death-rate of 2.33 per mille of strength against 22.59 in the year before. Of the 10 jails in the province, the 5 following recorded cholera in 1870:—Sylhet, strength 392, admissions 1 and deaths 1; Goalpara, 113, 1 and 1; Sibsagar, 133, 1 and 1; Tezpur, 198, 1 and 0; and Naga Hills, 10, 1 and 0 respectively. Of the 5 admissions, there were 2 in May, 2 in June, and 1 in August.

There are no complete statistics available to show the monthly mortality from cholera in this province during 1870. The following items are gathered from the general history of the cholera of that year given in the Report of the Sanitary Commissioner for Bengal for 1870:—

In Goalpara district 39 deaths from cholera were reported in January. This district "seems to be more liable to cholera than other places on the opposite bank of the river, owing, it is believed, to the abundance of jute and rice cultivation and the scarcity of water-supply during the dry season."

In Kamrup district cholera prevailed from February to May. "In Gauhati itself the disease appeared in April, in the Raja bazar, and spread thence to nearly every part of the station. It showed itself in the regimental lines in May, there being 10 cases, with 4 deaths. Its course in the district was from west to east along the traffic route."

In Nowgong "cholera sporadically occurred in different parts of the district; about 30 cases were recorded. The precautionary measures adopted on the outbreak of the disease consisted in isolating the attacked, in burying the dejecta, and in burning the clothing and bedding of those who died."

In Sibsagar "cholera is endemic in the district, and was prevalent in a sporadic form at several places almost all the year round." The first case appeared in March, and up to the end of the year 95 deaths were recorded.

In Dibrugarh there was no epidemic cholera in 1870. "The district was unusually healthy during the year."

The rainfall of 1870 was 137.54 inches, or about the average fall for the province, but compared with that of the preceding year it was fully 14 inches in defect. It was fairly distributed through the seasons, which each received its due proportion of the general fall. In the price of food there was a great improvement, although the rates still ranged high. The average price of rice fell to 18.77 sers the rupee against 12.56 sers in the year preceding.

1871.—In this year the statistics of cholera mortality among the civil population of the province became available for the first time. There is no detailed information available regarding the history of cholera in Assam in

1871, but the mortality returns show a very marked epidemic prevalence of the disease during the latter half of the year in the valley of the Brahmaputra (see Tables Nos. I. and II.) The total of cholera deaths registered in the whole province during the year is 5873, or at the rate of 1.42 per mille of the population. It is probable that, on the whole, the cholera of 1871 in Assam was—as normally due in this the third year of the triennial cycle 1869–71—less prevalent than that of 1870, but that it prevailed with considerable epidemic violence over a large area of the Brahmaputra Valley division. The distribution of the mortality by districts is shown in Table No. I., and by months in Table No. II.

It is recorded that the meteorological conditions which prevailed at Goalpara during the cholera months, as compared with the same months in 1869 and 1870, were—a mean temperature between that of the two years, a greater daily range of temperature, more cloudy days and more rainy days, a higher mean temperature of solar radiation, and for the year an earlier and prolonged but deficient rainfall. There are no comparable data for the other stations except in respect to rainfall. At Gauhati the rainfall was about 14 inches, or about a fourth below the average, and the rainy days were fewer. At Nowgong there was excessive rain, 47 inches, or fully one-half more than the average. At Tezpur there was an excess of 7½ inches, or a tenth, and at Sibsagar 30 inches, or a half, above the average. At all these stations the rains set in earlier and lasted longer than usual, and in all the number of cloudy and rainy days was unusually great.

Regarding cholera in Sylhet this year there is no information. In Cachar the disease appeared at Silchar on the 26th May, and ceased on the 10th July. There were 57 cases and 25 deaths in the town. "The disease was of a mild character, and showed no disposition to spread. It could not be traced to importation, and was due to endemic local causes." The first case, fatal on the fourth day, came from near the distillery; and twelve days after the death 4 other cases were brought to hospital from the same locality. The total mortality was 44.

In the Darrang district cases of cholera, it is stated, occurred all through the year, and were most frequent and virulent in July and December. In July the cantonments suffered especially, while the civil station was comparatively unaffected. In November and December there was a severe outbreak in the extreme western and extreme eastern parts of the district.

In Nowgong district cases were reported in June, increasing monthly in number and fatality till October, and continuing with more or less severity to the end of the year. There were 3 cases and 6 deaths in the jail in October. In Sibsagar cholera prevailed in a sporadic form during the greater part of the year, and appeared as an epidemic at some outlying tea gardens in the interior of the Golaghat subdivision during August, November, and December. Its appearance was sudden, and the seizures were limited to the Cachari coolies, of whom sixteen died in a fortnight, while other classes of labourers were unaffected. The town of Golaghat escaped the disease.

In Kamrup district cholera appeared in Gauhati on the 23d May, and lasted till 14th August, and again from the 14th to the end of October. In the district the disease was prevalent with increasing activity to the end of the year. In Goalpara district cholera was present throughout the year, and was epidemic in some parts.

In Lakhimpur district and the Khasi and Jaintia Hills there appears to have been no cholera in 1871.

The rainfall of 1871 was very deficient, being about 10½ inches less than

the average, as well as the fall for the preceding year, which was equal to average. It was distributed proportionally to the several seasons without much divergence from the ordinary course, except that the fall in the last quarter was unusually abundant. The price of food was slightly cheaper than in the preceding year, and though still somewhat high, caused no great distress among the people generally.

1872.—In this year cholera prevailed with a revived epidemic activity more or less throughout the year, and in both the valley divisions of the province. Among the civil population the death-rate was 2.10 per mille of population against 1.42 in the year preceding. This increased prevalence of the disease in 1872 was coincident with a very abundant rainfall following upon a year of drought, but with food at unusually cheap rates, a condition which apparently was not without effect in moderating the severity of the epidemic.

In Kamrup district the cholera of 1872 prevailed as an epidemic throughout the year, and caused a mortality of 3.6 per mille of the population. The return of deaths in January indicates the extension into this year of an epidemic prevailing at the close of 1871. In March and April the disease abated; it revived in May, and continued epidemically prevalent through June and July; it then steadily and gradually subsided during the following months, but was still actively present in December.

In Darrang district cholera was prevalent throughout the year, but in no month with excessive force. The death-rate for the district was 2.8 per mille of population.

In Nowgong district cholera prevailed with epidemic force only in January, and again in June. In September, October, and December no deaths were reported from the disease; in April only 1, in May 2, and in August 6. The total of deaths in the year was 352.

In Sibsagar district cholera was prevalent in January, and then disappeared until June, in which month it reappeared with some force, but subsided in August. In September it again broke out with violence, and rapidly increasing, culminated in November, and was still in high intensity in December, the total deaths registered during the year being 3074; of this number no less than 1362 occurred in November and 999 in December. In the civil station there were only 4 deaths; in the jail 2; but in Jorhât the mortality was very severe in November, the deaths returned in the first week of that month being 227, in the second week 251, and in the third week 255. In Sibsagar the cholera deaths during the same three weeks are given at 23, 45, and 71 respectively, and in Golaghat at 23, 17, and 50 respectively. The cholera death-rate of the year for the district was 10.30 per mille of population; but the rate varied greatly in the different registering circles. Thus in Birtolla it was 3.35, in Golaghat 5.22, in Jorhât 14.96, and in Sibsagar 12.16 per mille. The disease "occurred almost simultaneously in very many places; so much so that a few cases were heard of in almost every *mouzah* (village) throughout the district in the course of a week or ten days . . . It stayed but a few days at a time in any one spot, but moved from village to village, visiting almost every one of them, several times appearing and disappearing before taking its final departure." The number of deaths registered under the head of "bowel complaints" was very high in this year as compared with the number usually recorded in this district, and gave an annual death-rate of 2.84 per mille of population.

In Lakhimpur district cholera prevailed mainly in November and

December. Of the total 94 deaths registered during the year, 89 occurred in these two months; 51 of the 94 deaths were returned from the Lakhimpur circle in the months of August, September, November, and December. In none of the other months of the year were any deaths from cholera recorded.

In the Khasi and Jaintia Hills no cholera epidemic has been heard of since 1869; but it "is difficult to collect information regarding disease in these hills."

In Goalpara district cholera was prevalent throughout the year, the total deaths registered being 862. The months of highest mortality were July and August, November and December, and January and February. The prevalence of the disease is ascribed "to the very peculiar state of the weather," but no particulars on this point are mentioned.

In Cachar district the cholera of 1872 prevailed mainly in the months of March, April, and May, during which occurred 718 out of the total 782 deaths registered in the year. In the months of June, October, and November there was no death recorded from cholera; but in December the disease reappeared, with 18 deaths in that month. It is stated, however, that the disease "continued in the district throughout the year, carrying off large numbers of the people."

The rainfall of 1872 was the most abundant of any preceding year of our series, being 19 inches above the average annual fall for the province, and about 29½ inches above the fall of the preceding year. This great excess fell in the second and third quarters of the year (see Table No. V.), or in the season of the south-west monsoon. The price of food in 1872 was unusually cheap; the average price of rice was 23.92 sers the rupee against 19.25 sers in the year preceding.

1873.—There was a marked abatement in the prevalence of cholera in this year as compared with the experience of the preceding year. Among the civil population the death-rate fell to 1.40 per mille of population against 2.10 in the year preceding. This marked abatement of cholera prevalence was coincident with a season of extraordinary drought, but with food still at cheap rates.

The monthly returns of mortality (see Table No. II.) show that the epidemic activity of December 1872 culminated in January 1873; that the disease rapidly abated in February, and sank to a minimum prevalence in March; that the disease revived in April, and, rapidly increasing, prevailed at maximum intensity of the year during the next three months; that in August the epidemic commenced to abate, and, steadily subsiding, sank to a second minimum prevalence in November; and, finally, that in December the discase again resumed epidemic activity. The mortality registered from the cholera of 1873 in each district of the province is shown in Table No. I., which see.

The rainfall of 1873 was exceptionally deficient, the lightest registered in any year of our series; it was only 103.59 inches, that is, about 42¾ inches less than the fall in the preceding year, and 33½ inches less than the average fall for the province. This extraordinary defect occurred almost wholly in the second and third quarters of the year, or in the season of the south-west monsoon. The price of food continued cheap throughout the year, but with a tendency towards higher rates during its last two or three months.

1874.—In the normal course the cholera of 1874, as the third year of the triennial cycle 1872–74, was due as a cholera of minimum prevalence.

Experience, however, proved it to be otherwise. Among the civil population the death-rate in 1874 rose to 3.99 per mille of population against 1.40 in 1873.

The general seasonal course of the epidemic was, in the main, very similar to that which obtained in the preceding year (see Table No. II.) The revived activity of the disease, which commenced in December 1873, passed on into January 1874, and instead of the usual abatement in February or March, continued steadily and gradually to advance through these two months; but in April the disease acquired a fresh impetus, and in the next month rose by a great bound to the maximum rate of intensity; in June the maximum culminated, in July it still remained high, and in August showed the first signs of abatement. This abatement was continued through September and October, but in November there was a fresh outburst of epidemic violence, not much less severe than that of the preceding May; it was not, however, maintained with equal force, and in December the disease was sensibly declining. In both 1873 and 1874 the months of greatest cholera prevalence were April to August, and again November or December and January. This severe and irregular increase of cholera prevalence in 1874 was coincident with a season of heavy rainfall following on a year of exceptionally severe drought, and with food at famine prices.

The diffusion of the cholera of 1874, as compared with the returns for the preceding year, shows a very considerable increase of prevalence in most of the districts of the province. The disease, which was active at the close of 1873 in the districts of Kamrup, Darrang, Cachar, and Sylhet, was continued in them with increasing prevalence into 1874, and in January of that year reappeared in the districts of Sibsagar and Lakhimpur, after an interval of two and six months respectively; in February, after an interval of four months, in Goalpara; in March, after an interval of seven months, in Nowgong; and in the Khasi Hills, after an interval of five months, in May. Prevailing with varying degrees of severity in the different districts, but most severely in those of Kamrup, death-rate 10.5 per mille of population; Darrang, 12.6; Nowgong, 12.1; Lakhimpur, 7.0; and Sibsagar, 1.1, the disease, in all the districts except the Khasi Hills, continued active to the close of the year, prevailing with epidemic intensity in December in the districts of Sylhet, Darrang, Nowgong, Kamrup, and Goalpara. In its main features the deportment of the cholera of 1874 in no way differs from what has been repeatedly observed in the cholera statistics of the other provinces of India, except that the usual decline of the disease, previous to the spring rise in prevalence, is replaced by a steady increase in most of the districts; and the months of February and March, in place of showing a reduced mortality, exhibit a steadily increasing number of deaths till the month of June, in which the maximum monthly mortality of the year is reached. The fall from this to the September minimum prior to the autumnal rise is in the normal course. In the Goalpara district cholera had been mildly prevalent throughout its area from February to July inclusive, but during the next three months no death from this cause was registered in the district. In November, however, the disease appeared about the same time in two widely distant parts of the district, both lying on the banks of the Brahmaputra, viz., in two villages in the north-west corner of the district, on the right bank of the river, and in two villages in the eastern extremity of the district, on the left bank of the river.

In the Kamrup district the mortality ascribed to cholera is almost exactly one-half of the entire mortality registered in the district, viz., 5905

out of 11,920 deaths during the year, and is nearly treble the mortality registered from cholera in either of the two preceding years. The figures for the three years are—

1872 . .	Cholera deaths,	2,026.	Death-rate per mille of population,			3·6
1873 . .	,, ,,	2,201.	,,	,,	,,	3·9
1874 . .	,, ,,	5,905.	,,	,,	,,	10·5

In the Darrang district, as in previous years, the Mangaldi circle suffered most severely; it is situated in the south-west part of the district. The Deputy Commissioner writes—"I am of opinion that 1874 has been one of the most unhealthy years within the memory of the present generation. The reported deaths from cholera, especially in the Mangaldi subdivision, give but a very faint idea of the actual mortality which must have occurred between the months of April and July, and of course quite fail to indicate the number of cases which did not prove fatal. I may mention that on two occasions I had to order the burning of the dwelling-houses containing the dead bodies of an entire family, as, owing to caste prejudices, and doubtlessly in part to fear, no persons were forthcoming to bury the dead." The registered mortality from cholera in 1874, as compared with that of the two preceding years, is as follows:—

1872 . .	Cholera deaths,	508.	Death-rate per mille of population,			2·1
1873 . .	,, ,,	590.	,,	,,	,,	2·4
1874 . .	,, ,,	2,997.	,,	,,	,,	12·6

In the Nowgong district cholera prevailed with unusual severity during the entire year, the total deaths being 3106 against 168 in 1873 and 352 in 1872; the death-rates per mille of population being 12.1 against 0.6 and 1.3 respectively. In the Sibsagar district, on the other hand, cholera in 1874 was far less prevalent than in the two preceding years, the deaths registered being 337, or 1.1 per mille of population, against 527, or 1.7 per mille, in 1873, and 3074, or 10.3 per mille, in 1872. The disease did not prevail epidemically in this district in 1874, but there were some sharp outbreaks in the Golaghat and Jorhât circles during the months of February, April, November, and December.

In Lakhimpur district cholera prevailed throughout the entire year with greatly increased severity as compared with the two preceding years, the deaths being 855; or 7.0 per mille of population, against 377, or 3.1 per mille, in 1873, and 94, or 0.7 per mille, in 1872. The year 1874 was a most unhealthy one in this district, and the general mortality of every class of the population was considerably above the average of the preceding decade. The increase of sickness and mortality is attributed by the civil surgeon to the increased rainfall and its irregular distribution. He writes—"I find, on examination of the monthly meteorological returns, that, after exceedingly heavy and continuous rain during the latter part of April and commencement of May, there was an interval of fourteen days from 24th May to 10th June, in which only three-tenths of an inch fell. Another similar unseasonable period occurred from 18th to 28th July, in which only seven-tenths of an inch fell. The effect of this was to create two additional drying-up periods, in addition to the ordinary one in September and October, and the consequent increased production of miasmata." The months in which cholera chiefly prevailed were May, June, August, and September.

In the Sylhet district the cholera of 1874 was persistent throughout the year, and prevailed with more than treble the intensity of the mean of the two preceding years, the deaths being 2763, or 1.6 per mille of the popula-

tion, against 933, or 0.5 per mille, in 1873, and 524, or 0.3 per mille, in 1872. One-half of the total number of deaths registered in this district in 1874 is assigned to cholera, and there is no doubt that the disease was unusually severe and widespread during this year; the disease was prevalent in every month, but most so towards the fall of the year, the mortality in the last three months being much more than half that of the whole year. The whole of the 17 registration circles were affected, and in no month was cholera observed in fewer than 7 circles out of the 17.

In Cachar district, as in Sibsagar, the cholera of 1874 was milder than in the other districts of the province, the total mortality registered from it being less than half the mean of that of the two preceding years. The deaths were 219, or 1.0 per mille of population, against 194, or 0.9 per mille, in 1873, and 782, or 3.8 per mille, in 1872. It is stated that a large proportion of the cases observed in 1874 occurred among coolies, "who contracted the disease on their way up from Calcutta."

In the Khasi Hills the cholera of 1874 is represented by only 24 deaths recorded among a population of 15,458 within the registering area, out of the total population of 141,838 included within this district, thus giving a death-rate of 1.5 per mille against 2.1 per mille, or 33 deaths, in 1873, and 0.1 per mille, or only 3 deaths, in 1872. The circles under registration comprise only Cherra, Jowai, and Shillong; the villages on the northern and southern slopes of the hills are outside the registering area. Many deaths from cholera probably occurred in these villages of which there is no account. The year, however, was on the whole remarkably free from cholera in this district, and but few reports of its visitations were received. In the Garo Hills, where also registration of deaths is not in force, there appears to have been no cholera in 1874. In the Naga Hills also there appears to have been a complete immunity from cholera throughout the year. The civil surgeon writes—"Cholera did not make its appearance in the district."

The rainfall of 1874 was more than 38 inches above the very defective fall of the preceding year, and it was nearly 4½ inches above the average fall for the province. The fall in the first quarter of the year was unusually heavy; in the other quarters the fall was proportionally distributed, though that in the second quarter was also somewhat above the ordinary supply. In the price of food there was an extraordinary and sudden rise in 1874 from the rates obtaining in the preceding year. The average price of rice rose to 13.85 sers the rupee against 22.18 sers in 1873, a high rate little different from those ruling in the famine years 1866 and 1869.

1875.—No report on the sanitary administration of the Assam Province for 1875 was published, and there are consequently no statistics available to show the monthly mortality registered from cholera among the civil population during that year. The total deaths registered from cholera in each district for the year 1875, however, have been published, and are shown in Table No. I. The total number is 6618 against 16,478 in the preceding year, or at the rate of 1.74 per mille of population against 3.99 respectively. This abatement of the disease in 1875 was coincident with an average rainfall, and with somewhat improved prices of food, though the rates were still very high.

The cholera epidemic of 1874 was on the decline in 1875 in the province as a whole, but the returns show that the disease was epidemically prevalent during the latter year in some districts which had escaped with a comparatively mild visitation in the preceding year. Thus in Goalpara the mortality from cholera in 1875 is represented by 2288 deaths registered against 272 in

1874; in Sibsagar the figures are 777 and 337 respectively, and in Cachar they are 989 and 219 respectively. But in all the other districts the cholera mortality of 1875 was greatly below that of 1874.

For the rainfall and food-price of 1875 see Table No. V.

1876.—Among the civil population the returns show a considerable increase in the death-rate from cholera in 1876, the figures being 2.20 per mille of population in 1876 against 1.74 in 1875. The year 1876 differed little from the year preceding in respect to the quantity of rainfall and to the prices of food.

The mortality returns for the civil population show a general abatement of epidemic cholera activity during 1876, except in the districts of Sibsagar and Sylhet, in which the disease prevailed with greatly intensified force compared with the preceding year. In some of the other districts also the cholera of 1876 was more severe than that of 1875, as in Nowgong and Lakhimpur; in these districts it appears that the general epidemic of the preceding year had only now reached its climax. In the Sibsagar and Sylhet districts the monthly returns show cholera to be in active epidemic prevalence in January as the continuation of the disease from the previous year.

The seasonal prevalence of the disease in the province as a whole is exhibited in Table No. II. There is the usual activity in January, abatement in February, revival in March, and increased prevalence during the next three months, decline in July, and steady subsidence through the succeeding months to November, and renewed activity again in December.

1877.—Cholera still continued to prevail with increasing epidemic severity during 1877. Among the civil population the death-rate was 2.90 per mille of population against 2.20 per mille in 1876. This increased prevalence of cholera in 1877 was coincident with a very defective rainfall and very high prices of food.

The districts that suffered most severely were Nowgong, death-rate 9.7 per mille of population, Darrang 9.2, and Sylhet 1.6. Of the towns, Dibrugarh was the greatest sufferer, 103 deaths from cholera being registered, or at the rate of 26.6 per mille of population. The rates were also excessively high in the towns of Silchar, 11.5 per mille, Tezpur, also 11.5, and Nowgong, 10.4 per mille. In the town of Sylhet the rate was 6.9 per mille.

The mortuary returns show that during the first three months of the year the districts of the Brahmaputra Valley were comparatively free from cholera, and that the disease was mostly prevalent in the districts of the Surma Valley. Thus of 391 deaths registered in January only 30 were returned from the former division, of 370 in February only 33, and of 263 in March only 43. Of the remaining deaths in each month, the greater proportion were returned from the Sylhet district. In April the disease started into activity in Sibsagar, Nowgong, and Darrang, and in each district ran a violent epidemic course. In May cholera acquired fresh activity in Kamrup, and reappeared in Goalpara after an absence from the district of three months, and in both prevailed with varying degrees of epidemic severity.

Comparing the returns for 1877 with those for the preceding year, the figures show that the cholera of 1876, which in Sylhet burst out into fresh epidemic activity at the close of that year, passed on into 1877, and continued to prevail in that district throughout the year, with an interval of abated prevalence during the months of July, August, and September; that the revived activity of the disease in Cachar at the close of 1876 was continued on into the succeeding year, and, with an interval of abated activity in March, prevailed epidemically till the end of June, after which it gradually

subsided, but showed signs of its presence in the district up to the end of the year; that in Kamrup the subsiding epidemic of the preceding year acquired a slightly increased prevalence in the beginning of 1877, and this continued until May, when a marked rise in the mortality took place, and in June attained the maximum of the year at a bound, the high mortality continuing during July subsided considerably in August, and falling suddenly in September, continued abating to the close of the year, the minimum monthly mortality of the year, 6 deaths, being registered in December; that the interrupted prevalence of the disease in Goalpara during 1876 was repeated in 1877, in both years the months of August and September showing blanks of mortality, and the earlier months a very low mortality.

The returns show that in Nowgong, Darrang, and Sibsagar the subsided epidemic of 1876 remained quiescent during the first three months of 1877, and then burst out with epidemic force simultaneously in all the districts during April; that the disease ran a very similar course in each district, though at different rates of severity, during the three succeeding months, then began to subside, and finally ceased with the close of the year in Sibsagar and Darrang, whilst in Nowgong it resumed epidemic activity in October, and kept at a high rate of prevalence till the close of the year; and that in Lakhimpur cholera reappeared in February 1877, after an absence of six months from the district, and with slight fluctuations attained maximum prevalence in June, then abated, and remained quiescent in October and November, but reappeared in December, with 8 deaths registered in that month.

Referring to the sickness and mortality on board the river steamers carrying coolies, Dr. A. C. C. De Renzy, Sanitary Commissioner for Assam, writes—

"For many years back the coolies who are imported from Bengal in steamers *vid* the Brahmaputra have experienced a very heavy rate of mortality while in transit, chiefly from cholera. Taking the returns for the last three years, the mortality on the passage, which averages about twenty days, was at the rate of 45 per cent. per annum. During the same period the mortality of the coolies exported from Calcutta for the West Indies and other colonies was only at the rate of 7.63 per cent. per annum. Thus the death-rate of the Assam coolies was nearly six times as great as that of the colonial coolies. The explanation of this extraordinary fact that would probably first suggest itself is that the Brahmaputra is a very unhealthy river. But against this idea we have to oppose the fact that of the passengers on board the river steamers it is only the coolies that suffer from cholera, the disease that causes almost all the deaths amongst them. Cases of the disease are extremely rare among the European passengers and the Native crews of the steamers, who live in the closest contact with the coolies."

1878.—In this year there was a very marked abatement in the prevalence of cholera in Assam. Among the civil population the death-rate was 1.70 per mille of population in 1878 against 2.90 in 1877. This abatement in the prevalence of the cholera of 1878 was coincident with an exceptionally heavy rainfall, and with the price of food at famine rates.

Compared with the returns for the preceding year, the corresponding statements for 1878 show a very marked decline in the epidemic prevalence of cholera in the Assam Province. The death returns for the several districts show a continuation into the beginning of 1878 of the cholera epidemically prevalent at the close of 1877, the usual abatement in the activity of the disease in February, and again in September, and its increase in prevalence from these two seasons to the middle of the hot weather and middle of cold weather respectively. The number of deaths in May and December (see Table No. II.) represent the maximum intensity of the spring and autumn epidemic activity, and in this year are remarkably equal in degree

of fatality. In February and September, the periods of minimum spring and autumn prevalence respectively, there is not observable a similar equality in the amount of mortality; of the 112 deaths registered in September, more than half were returned from the Sibsagar district alone, and of the 281 in February, about 120 may be attributed to the commencing revival of epidemic cholera activity in the Sibsagar, Cachar, and Lakhimpur districts. At the close of 1878 all the districts, except Lakhimpur, show the presence of cholera; and those of Goalpara, Kamrup, Sibsagar, and Sylhet exhibit the disease in full epidemic force.

Of all the districts, Lakhimpur suffered most severely from cholera in 1878, the death-rate being 6.2 per mille of population; in this district, out of a total of 2130 deaths from all causes, 753 were attributed to cholera; yet Dr. White, the civil surgeon, says that the number falls far short of the truth. He writes—"I will cite one instance in support of this assertion. The total number of deaths from cholera is returned at 753; the deaths from the disease among the imported labourers in the neighbourhood of Sadiya exceeded the number returned from the entire district. From information in my possession I am able to state that the deaths from cholera last year in this district exceeded 1800. Captain Woodthorpe's survey party, consisting mostly of Khasi and Nepalese coolies, lost 15 per cent. of their strength from the disease. They were isolated in the jungle, far away from human habitation, when they were attacked, and, so far as could be ascertained, the disease originated spontaneously among them."

Regarding a severe outbreak among imported labourers, Dr. White writes—

"Early in April a severe outbreak of cholera occurred among the imported labourers of the Dum Duma Tea Company, situate 44 miles from Dibrugarh. It was preceded by unusually heavy rain, which caused the water in the River Dibru (on the banks of which the coolie lines are built) to rise from 7 to 10 feet. The rise of the river took place on the 11th April, and on the 13th the first case appeared. The outbreak lasted until the 30th April, 42 persons having been attacked. The disease did not spread to any of the numerous tea gardens in the neighbourhood, except one at Rangagora, about 18 miles lower down the same stream, the coolie lines in this case being also on the banks of the Dibru. These circumscribed outbreaks of cholera occur nearly every year on the first rise of the smaller rivers, and are, as a rule, confined to villages and factories situated on the river-bank."

In July and August cholera prevailed in the station of Dibrugarh, "but its ravages were confined to one bazar, the poorest and most crowded part of the settlement." Cholera prevails in the Lakhimpur district, with more or less severity, every year, observes the Sanitary Commissioner, and "is the scourge of the Native population; but, strange to say, the European population enjoy marked freedom from its ravages." On this subject Dr. White writes—

"In the history of cholera in Upper Assam there is nothing more marked than the immunity enjoyed by Europeans. From 1859 to 1863, while European troops were stationed here, cholera raged for the greater portion of that period; the sick European soldiers were treated in the station military hospital in the same ward in which the cholera cases from the Native regiment and battery were received. Not a single case occurred among the Europeans. The planters, now a numerous body, are constantly brought in contact with the disease in attendance on their coolies, but not one of their number has ever been attacked. During the twenty years that I have been here only five cases of cholera are known to have occurred among the European population."

The rainfall of 1878 was an exceptionally heavy one; it exceeded that of the preceding year by about 30½ inches, and was nearly 19½ inches above the average fall for the province. The excess fell almost entirely in the third

quarter of the year (see Table No. V.) The price of food in 1878 was at famine rates; the average price of rice was only 9.03 sers the rupee against 13.62 sers in 1877, and 22.89 sers in the year of plenty, 1868. The price of rice varied greatly in the different districts. In the Lakhimpur district the price of the best kind was only $5\frac{1}{8}$ sers the rupee, and of the common kind $8\frac{1}{2}$ sers the rupee; salt also was very dear in this district, the price being 6 sers the rupee. In the other districts the price per rupee of the common kind of rice varied from nearly 12 sers to $13\frac{1}{2}$ sers, and of salt from $6\frac{1}{3}$ sers to $8\frac{1}{2}$ sers. The price per rupee of the best kind of rice was 6 sers in Sibsagar, 7 sers in Darrang, $9\frac{1}{3}$ sers in Nowgong, and in the other districts, except Lakhimpur, varied from about $10\frac{1}{5}$ to $11\frac{1}{5}$ sers. The pulses, ghee, oil, and other common articles of diet were excessively dear, and more or less beyond the reach of the labouring people. The Assamese, however, live largely on fish, and every roadside ditch contains fish. Large numbers of the people are employed in catching fish. They bale the water out of the ditch, and then take the fish in baskets in the mud.

1879.—Cholera in this year prevailed with greatly increased severity in Assam as compared with the experience of the preceding years. Among the civil population the death-rate was 4.59 per mille of population against 1.70 in the preceding year. This increased prevalence of cholera in 1879 was coincident with heavy rainfall and continued high prices of food.

The total number of cholera deaths registered among the civil population of the province in 1879 is 17,415 against 6732 in 1878. Yet the Sanitary Commissioner writes—"There can be little doubt that these figures greatly understate the mortality due to this terrible scourge." Compared with the corresponding statements for the preceding year, the monthly mortuary returns for the province as a whole show that the autumn epidemic, which reached its climax in December 1878, passed on into January 1879 with but little diminished fatality (see Table No. II.); that in February there was, as usual, an abatement, followed in March by a revived activity of great epidemic force, which, rapidly progressing, culminated in April; that in May, though still very severe, the epidemic began to decline, and in June had sensibly abated; that thereafter the disease rapidly subsided, and sank to a minimum, as usual, in September; and that in October, the disease renewing, activity continued, with a slight check in November, to increase to the end of the year, but with greatly less force than it exhibited at the beginning of the year.

The monthly returns for the districts, taken separately, show the continuation of the preceding year's cold-weather epidemic into the early part of 1879 in Goalpara, Kamrup, Sibsagar, and Sylhet, and to a lesser degree in Darrang also. In Nowgong the cholera of 1879, after a lull in January, recommenced activity in February, and then, increasing rapidly, ran a severe epidemic course similar to that observed in the other districts above named. In Lakhimpur and Cachar the cholera of 1879 is shown to be fitful and dying out, with a flare-up in Lakhimpur from March to May inclusive, and in Cachar from March to June inclusive; and then with no signs of the presence of the disease in either district during the remainder of the year until its close, when in December 2 deaths registered in Lakhimpur and 5 in Cachar announce the reappearance of the disease. In all the districts, excepting Sylhet and Nowgong, both of which show an increased activity of cholera at the close of the year, the tendency of the disease was very markedly towards a complete subsidence after the termination of the rainy season, although in Sibsagar and Kamrup cholera prevailed persistently throughout the year.

The highest rate of mortality, 17.57 per mille of population, and the highest number of deaths, 4148, is shown by Darrang; and of that number no less than 3342 were reported from 34 villages in the Mangaldi subdivision alone, and the remaining 806 from the other parts of the district. It is noted that the epidemic, which commenced in January, and went on steadily increasing in prevalence till the week ending 19th April, markedly abated during the succeeding week, in coincidence with a rainfall of more than 1½ inch during the week ending 26th April. Regarding the sanitary conditions under which this epidemic appeared, Dr. Warburton, the civil surgeon, writes—"As the streams and tanks in the more thickly populated parts are almost entirely dried up during the latter part of the cold weather, and what little remains is sluggish and stagnant, and there are no wells of any depth from which good water can be obtained, it is not a matter of surprise that epidemics of cholera are widespread and of frequent occurrence. In one thickly populated part of the subdivision, watered by a small stream called the Beja, which rises in and flows through rice-fields, villages were almost depopulated and whole families destroyed. When the rains had fairly set in and the hill-streams were again in force, with a pure supply of water, the cases of cholera became rapidly less numerous."

The Nowgong district was the next greatest sufferer from cholera in proportion to its population, the total deaths recorded being 3059, or 11.93 per mille. Regarding the meteorological conditions under which the epidemic occurred, the civil surgeon says—"There was a scanty rainfall and a high temperature in the early part of the year. The rainfall up to the end of April was less by 3.25 inches than in the previous year, and the temperature (98° F.) the highest reached during the year. In April the largest number of deaths from cholera, viz., 1055, was recorded." Mr. Hughes, the civil surgeon, gives the following table in illustration of the statement that as the rainfall became heavier and the temperature lower the cholera mortality declined:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Cholera deaths . . .	1	19	192	1,055	989	405	213	1	0	17	8	159
Rainfall	·89	·07	·24	2·57	7·92	15·67	34·07	12·50	6·94	3·58	·62	·95
Temperature, maximum	?	?	?	98	90	90	89	90	90	?	?	?
Do., mean maximum	?	?	?	89	85	85	86	86	86	?	?	?

In the Darrang district, on the opposite side of the Brahmaputra River, the cholera of 1879 ran a very similar epidemic course as to season as in Nowgong, but there was no cold-weather revival of the disease in this district as in Nowgong.

In the Kamrup district the mortality registered from cholera—4086 deaths, or 7.41 per mille of population—was very nearly half of its entire registered mortality, viz., 8373 deaths. The disease was a continuation of the epidemic of 1878, and attained its climax in 1879 during the hot, dry, still days of April, when 949 deaths were registered. As soon as the thunderstorms broke over the district, says the civil surgeon, and heavy rainfall, the temperature was reduced, and the disease immediately began to subside, though many cases continued to be reported down even to June

and July. The first three months of the year and up to the middle of April, during which the epidemic was steadily growing in dimensions, were marked by an exceptionally small rainfall—smaller, in fact, than had occurred in any of the previous thirteen years. Many of the villages in this district stand on the higher ground bordering the vast swamps which characterise these regions, and their water-supply for domestic purposes is either directly from the swamp or indirectly of swamp origin. Wells are absolutely unknown, but in some villages there are tanks. In March and April cholera was extensively prevalent all over the civil station of Gauhati, but it was exceptionally prevalent and virulent in that portion of the station which borders on a blind channel of the river. Altogether 100 deaths from cholera were registered in the civil station. Every element in the population suffered; the Europeans had two deaths; the jail, the troops, and the police were also affected in common with the general native population.

Regarding the cholera of 1879 in the Goalpara district, the civil surgeon says that the epidemic prevailed during the great heat of March, April, and May, when the water in the ponds and small streams began to fail, and began to give off a very offensive smell. "The disease ceased, as if by magic, on the first copious fall of rain."

In the Cachar district only 71 deaths from cholera were registered in 1879, and of these 48 occurred in the month of May, "the sufferers being mostly tea-coolies, who were attacked on their road from Calcutta." It is stated that a most destructive epidemic of cholera occurred at Shillong and in the neighbouring villages, the deaths caused by which are not entered in the returns, as registration was not yet commenced in these hills. In the Khasi Hills 16 villages are known to have suffered, and the total number of deaths reported from them amounted to 473.

The rainfall of 1879 was again unusually abundant, being about only 5½ inches less than the exceptionally copious fall of the preceding year, and about 14 inches above the average fall for the province. The excess fell entirely in the second and third quarters of the year, or the season of the south-west monsoon rains. In the price of food there was a very marked improvement during 1879, but rates still ruled excessively high. The average price of rice was 14.70 sers the rupee against 9.03 sers in the preceding year.

1880.—In this year the prevalence of cholera in Assam sank to a minimum. Among the civil population the death-rate in 1880 was only 0.74 per mille of population against 4.59 in 1879. This marked subsidence of cholera in 1880—the last year of the triennial cycle 1878–80—was coincident with an abundant rainfall and cheap food.

Compared with the course of the disease in the preceding year, the returns for 1880 show a very marked subsidence of cholera in all the districts, and an almost complete quiescence of the disease during the months of August and September, with a renewal of activity in October, which continued progressively increasing to the close of the year. Taking the districts separately, Kamrup, Nowgong, Sylhet, and Cachar show that the epidemic, which had resumed activity in them at the close of 1879, was continued into 1880 with increasing severity, except in Nowgong, where the climax of the preceding autumn epidemic was reached in December; but in all these districts the force of the disease was greatly less than in the early part of the preceding year. In Nowgong the cold-weather revival of the disease attained its climax in December, the deaths in that and the preceding month being the highest of all, and together considerably exceeding

the half of the entire cholera mortality of the year in this district. In Sylhet cholera disappeared almost entirely during the months from August to November inclusive, only a single death recorded in September representing the presence of the disease during those four months; but 125 deaths registered in December mark a late and violent revival of the disease in this district.

In Goalpara, Darrang, Sibsagar, and Lakhimpur the cholera of 1879 is shown to have more or less completely subsided at the close of that year, without any recrudescence in the autumn and winter months. In Lakhimpur the presence of the disease is shown by 2 deaths registered in January 1880, but in the other districts of this group its presence is first shown by 7 deaths in February in Goalpara, and 1 each in Darrang and Sibsagar. With this commencement, the disease ran a very mild course during the succeeding months, and in August ceased entirely in all the districts, except Sibsagar, in which district it broke out afresh in September, and rapidly attained its maximum intensity in October and November, and began to decline very markedly in December. In the other three districts the cold-weather revival of cholera took place in Darrang in October, in Lakhimpur in November, and in Goalpara not till December. The cold-weather cholera was more severely prevalent in Nowgong, Sibsagar, and Sylhet than in the other districts of the province, and Goalpara and Sylhet show a late and active revival of the disease in December.

The following particulars regarding the cholera of 1880 in the different districts are gathered from the Sanitary Report for the Assam Province for 1880, by Dr. J. J. Clarke:—

In Goalpara the cholera mortality of the year is regarded as exceptionally small, and it is recorded by the civil surgeon that "there is a tendency to epidemic outbursts of cholera in the district only every third year, and that there is a partial immunity from invasion of the disease in the intervening period." The cholera death-rate for 1880 is only 0.41 per mille of population against 3.34 per mille in 1879.

In Kamrup only 320 deaths were registered from cholera in 1880, or 0.58 per mille of population, against 4086 deaths, or 7.41 per mille, in 1879.

In Nowgong the cholera mortality in 1880 was only one-sixth that of the preceding year, viz., 2.09 per mille against 11.93 respectively. It is stated that there was a smart outbreak of cholera at Koliabar in October, and at Jagee in November. "These two places are 60 miles apart, and have little intercommunication with each other. The disease appears to have anchored itself at each place, and at each place the outbreak was local. Although there is a constant traffic on the highroad, many halting-places, and many villages from Koliabar to Nowgong, a distance of 32 miles, the disease did not anywhere spread." In the notice of cholera in this district in the preceding year's review, a statement was given in illustration of the influence of rainfall and temperature on the prevalence of cholera, as furnished by the civil surgeon, Mr. Hughes. It showed that the cholera, which was violent and general in that year, suddenly burst into greatly increased activity in April, and subsided in July, decreasing each month in severity as the rainfall increased and the temperature fell. For the year 1880 Mr. Hughes furnishes the following tabular statement illustrating the rainfall, temperature, and cholera mortality from April to September in comparison with those of the same months in 1879. The table, as he observes, "may tend to prove that there is some connection between a high temperature and low rainfall and the active production and dissemination of cholera."

STATEMENT *showing in comparison the Rainfall, Temperature, and Number of Deaths from Cholera from April to September for the Years* 1879 *and* 1880.

Year and Month.		Rainfall. Inches.	Temperature.		Number of Deaths Registered from Cholera.
			Mean Maximum.	Mean Minimum.	
April	1879	2·57	98	89	1,055
	1880	4·97	82	73	10
May	1879	7·92	90	85	989
	1880	4·33	85	77	14
June	1879	15·67	90	85	405
	1880	19·08	85	80	13
July	1879	34·07	89	86	213
	1880	17·11	87	81	1
August	1879	12·50	90	86	1
	1880	7·17	87	84	5
September . .	1879	6·94	90	86	...
	1880	4·77	88	81	11
Totals . . .	1879	79·67	91	86	2,663
	1880	57·43	85	69	54

The civil surgeon remarks that in this district the water-supply is generally of a very impure nature, and that the people "live imbedded in jungle, which is never cleared." Cholera, he says, is most severe one year, and mild and sporadic the next. When cholera breaks out in a village, no measures are adopted by the people to arrest its progress. Cholera-infected clothing, if washed at all, is washed in or near the village ditch or pool, which supplies drinking-water, and the sick and well inhabit the same house.

In the Darrang district the cholera mortality of 1880 was at the rate of 2.49 per mille of population against 17.57 in 1879. The civil surgeon remarks—"After the fearful epidemic of 1879, we shall probably enjoy some slight immunity from cholera for the next year or two, though no change has taken place in the way of sanitation, and all those conditions—bad air, bad drainage, and bad water—which favour the growth and spread of disease exist in a marked degree." Regarding the relation between the rainfall and prevalence of cholera, the Sanitary Commissioner writes—

"Each month during the present year shows a considerable rainfall; but in 1879 there was a marked absence of rain until the middle of May, and cholera, it is recorded, raged all over the district until the rains set in, when the number of reported cases became rapidly less, and by the end of July the epidemic had ceased to exist. It would appear that the early setting in of the rains and a steady rainfall till late in the season act as a check to the growth of cholera; and this is a very prevalent idea of many local observers. . . . Many of the villages in this district, if not nearly all of them, are in a most insanitary state. . . . They are planted in the midst of jungle and a dense growth of bamboos; they are excluded from the sun or breeze, and for the first foot or two the soil consists almost entirely of animal excreta; there is no drainage, and they are flooded more or less for one-half of the year, and are exceedingly damp and unwholesome the other half."

In Sibsagar district the cholera mortality of 1880 was at the rate of 1.65 per mille of population against 3.27 in 1879. In October there was a severe outbreak of cholera among the boatmen at Golaghat; it lasted twelve days, and killed 12 out of 21 attacked; it was noticed that the boats attacked were

those lowest down the stream, where the water was almost stagnant, and was always in a filthy state from all the natives washing in it. Those boats stationed in the upper part of the knee-bend of the stream, where the water ran rapidly, never had a case.

In the Lakhimpur district the cholera of 1880 was more severe than that of the preceding year, the death-rate being 2.16 per mille of population against 1.49 per mille in 1879. The disease prevailed in two distinct little epidemics; the first during April, May, and June, and the second during November and December. For the past two years the district has escaped any severe explosion of cholera. The cases which have occurred are reported as scattered and isolated.

In Sylhet district the cholera mortality of 1880 was at the rate of only 0.42 per mille of population against 2.05 in 1879. During the four months August to November only a single death from cholera was reported, and that in September. The rainfall during the year, it is stated, was 173 inches, or about 15 inches over the average. In March an abnormal flooding occurred, the result of an exceptionally excessive rainfall. Coincident with this inundation, as shown by the death returns, was a sudden check in the fatality of the cholera, which was epidemic from January to April of this year, prior to the usual flooding season.

In Cachar district the cholera death-rate in 1880 was 1.15 per mille of population against 0.34 in 1879. The disease was nowhere epidemic, and was almost entirely confined to the first half of the year, no death being recorded during the four months July to October, and only one in November and two in December.

Regarding cholera in the Khasi Hills, where registration is not in force, it is recorded that there was no epidemic of the disease during 1880, but that in 1879, the first time for ten years, there was a fierce explosion of epidemic cholera in these hills; and it is interesting to compare the rainfall of 1878, 1879, and 1880. The subjoined table, furnished by the civil surgeon, is an interesting record. It shows the contrast between the rainfall of the cholera year 1879 and that of the year before and the year after it, both free from cholera :—

Months.	1878.		1879.		1880.	
	Monthly Rainfall.	Rainfall of First Five Months.	Monthly Rainfall.	Rainfall of First Five Months.	Monthly Rainfall.	Rainfall of First Five Months.
January	...	...	...	...	1·72	...
February	1·04	...	0·80	...	2·35	...
March	3·22	...	0·20	...	5·06	...
April	5·51	...	1·43	...	4·00	...
May	13·36	23·13	6·35	8·78	7·91	21·04
June	16·56	...	16·51	...	28·70	...
July	14·89	...	12·21	...	15·37	...
August	30·61	...	16·39	...	18·41	...
September	11.36	...	25·77	...	11·34	...
October	9·78	...	7·10	...	2·14	...
November	1·29	...	0·15	...	0·20	...
December	0·18	...	1·50	...	1·18	...
Totals	107·8	...	88·4	...	98·38	...

The small quantity of rain which fell in the first five months of 1879, as exhibited in the table, is very striking. The civil surgeon, Dr. O'Brien, remarks—"The atmosphere in May was unusually still, the sun powerful, and the water in the streams and wells reduced to its lowest level. When this state of things had reached its highest, viz., towards the end of May, cholera was introduced into the station of Shillong by a body of infected coolies. Within a few days the disease began to spread on every side. Looking back to the epidemic of 1869, I find that a very similar state of things prevailed. Cholera was then introduced into the station in the month of July. The sun was, of course, at its highest in that month, and the rainfall was unusually small. The average rainfall in July is over 15 inches, whereas in July 1869 it was only 11.9. The medical officer who reported on the epidemic of that year observes—'With the exception of the stillness of the atmosphere and a small rainfall, there was nothing peculiarly remarkable in the atmospheric phenomena.' Thus, as far as the meteorological influences go, an almost similar state of things existed in the two epidemic years." In the cholera epidemic of 1880 in the Khasi Hills the records alone show that there were 16 villages attacked and 473 deaths.

In respect to the statement of Dr. O'Brien that the cholera of 1880 in Shillong, and also that of 1869, was imported, the Sanitary Commissioner observes that, from the records above mentioned, "it is highly probable that the materies of the epidemic had even already preceded the advent of the coolies," so far as concerns the alleged importation in 1880; and he writes further on—"I may here remark that the epidemic of 1869 manifested itself by a show of sporadic cases in the hills in the month of May, travelling from the direction of Jaintiapur, on the borders of Sylhet, but that it was not until the 11th July that it broke out in an epidemic form in Shillong. It would appear, therefore, that the epidemic of 1869 and 1879 entered the hills in the same month of each year." The Khasi people are described as a sturdy, healthy, and happy race. They are "not fettered by caste prejudices, neither in the way of food nor labour; but they will not perform the duties of scavenging." They live in very dirty villages, but their life is almost entirely an outdoor life. They cultivate the potato in immense quantities, and scurvy is nowhere found among them.

The rainfall of 1880 in the Assam Province was only a little less than 2 inches below the abundant fall of the preceding year, and was about 12½ inches above the average fall for the province. The excess fell almost altogether in the first quarter of the year, the amount registered in the three months of that period being exceptionally high—18.55 inches (see Table No. V.) In the other quarters the rainfall was proportionally normal. There was a great improvement in the rates for food in 1880, and the high prices and famine distress of the preceding six years were replaced by cheap prices and plenty. The average price of rice in 1880 was 20.10 sers the rupee against 14.70 sers in 1879, and 9.03 sers in 1878.

1881.—In this year, the first of a new triennial cycle, there was a decided renewal of epidemic cholera activity in the Assam Province. Among the civil population the death-rate of 1881 was 1.30 per mille of population against 0.74 in 1880. This increased activity of the disease was coincident with a markedly diminished rainfall as compared with that of the preceding year, though still above the average fall for the province, and with a continued and considerably greater cheapness in the prices of food. These favourable conditions doubtless operated to influence the moderation of the normally recurring epidemic activity of cholera in this year.

Compared with the course of the disease in 1880, the returns for the civil population show a considerably increased prevalence of cholera in 1881, although, compared with the results of 1879, the disease was in very markedly less strength during both of the later years. The cholera of 1879 was a great cholera in this province, and prevailed with epidemic violence only during the first half of the year. By August and September the disease had ceased entirely in all the districts, excepting Kamrup, in the Brahmaputra Valley, and Sylhet, in the Surma Valley, in each of which it maintained a persistent activity to the close of the year, and in Sibsagar, where cholera lingered at a minimum of prevalence, represented by two deaths in each of those months. In October, however, the disease recommenced epidemic activity in Nowgong, and in December reappeared in all the other districts from which it had previously disappeared, whilst in Sylhet it received a fresh accession of force.

The cholera of 1880 was a cholera of very mild prevalence in this province; but it presented two distinct epidemic outbreaks, the one in the first half of the year, the other in the second. The year had commenced with the cholera, which sprang into fresh epidemic activity at the close of the preceding year, in steady epidemic progress in the districts of Kamrup, Nowgong, Sylhet, and Cachar—that is, in each of the two great river-valley divisions of the province—during the month of January. In February the disease appeared in all the other districts of the Brahmaputra Valley, but in very mild form; and running its course during the succeeding months, finally subsided in July. In August cholera again revived in the districts of the Brahmaputra Valley, principally in Nowgong and Sibsagar, and during the following months ran a second epidemic course, in which by the end of the year every district in the province was involved, the disease at the close of the year being most active in Sylhet and Nowgong, and subsiding in Sibsagar.

The cholera of 1881, like that of 1880, presents a double epidemic, but differently disposed in their seasons of activity and localities of prevalence. The year opened with the cholera brought over from the close of the preceding year on the decline everywhere, except in Sylhet, where the disease ran a sharp and independent epidemic course, which, with a very marked abatement in February and again in June, finally subsided in November, but again revived in December. In the Brahmaputra Valley the cholera, which was active in January, had entirely ceased during February and March, except in Kamrup and Nowgong, where also it had sunk to a minimum in March, represented by five deaths in each district. In April, however, cholera broke out into epidemic activity in all the districts of the Brahmaputra Valley; and the disease in Sylhet also attained its second maximum intensity of the year in this month. In the Brahmaputra Valley the epidemic prevailed with very varying fluctuations in the several districts, and, whilst most severe in Kamrup, prevailed to the end of the year in all the districts, excepting Goalpara and Lakhimpur, in both of which the disease made but little, and that a fitful, progress. In the other districts of this valley division the epidemic showed a marked renewal of activity during the last three months of the year, and in December cholera was in full epidemic force in Kamrup and Sibsagar; but in Nowgong it had already commenced to subside, and in Darrang had ceased, with only two deaths recorded in that month. Thus the year 1881, which began with 570 cholera deaths recorded in January, ended with 594 in December. The highest mortality of any one month fell in November. In the months of February and September, as also in

May, there were sudden checks in the progress of the disease, marked by very distinct falls in the mortality during those months. The district of Cachar remained almost wholly free of the disease throughout the year, and the town of Silchar remained absolutely exempt. The districts which suffered most severely were Kamrup, with a death-rate of 2.66 per mille of population; Nowgong, 2.35; and Sibsagar, 2.05. Of the principal towns in the province, Gauhati suffered most severely, the deaths registered being 216, or at the rate of 18.47 per mille of population. In Sibsagar town the deaths were 36, or at the rate of 6.13 per mille, and in Nowgong they were 20, or at the rate of 4.71 per mille. In none of the other towns did the rate reach 2 per mille of population.

The following particulars, among others, are recorded of the incidence of the cholera of 1881 in the several districts:—

In Goalpara the total of cholera deaths registered in 1881 is 57 against 166 in 1880. The disease appeared in a sporadic form just before the rains in the different parts of the district, and subsequently subsided. In the town of Dhubri only 9 cholera deaths were registered, death-rate 1.74 per mille of population; "they occurred chiefly before the rains commenced in May."

In Kamrup 1719 cholera deaths were registered in 1881 against 320 in 1880. The disease commenced epidemic activity in April, and prevailed with considerable severity to the close of the year. The following tabular statement illustrates the monthly rainfall and temperature, side by side with the incidence of the disease, in the town of Gauhati and the district during the year:—

Months.	Temperature.		Rainfall.		Total Deaths from Cholera.		
	Mean.	Mean of Sixteen Hours.	Days.	Inches.	Town.	District.	Total for the Whole District.
January	61·94	64·30	...	...	...	12	12
February	60·00	57·15	2	0·34	...	10	10
March	65·77	74·33	12	3·96	...	5	5
April	70·75	79·13	18	6·45	2	17	19
May	74·75	81·00	19	10·23	12	24	36
June	76·79	86·29	24	11·38	61	128	189
July	77·86	87·14	20	6·97	46	124	170
August	79·85	85·25	18	16·51	20	247	267
September	78·39	83·43	18	15·20	2	185	187
October	71·12	79·24	3	1·09	64	194	258
November	67·80	76·48	...	...	8	179	187
December	62·37	66·67	...	...	1	378	379
Means and totals	71·01	76·66	134	72·13	216	1,503	1,719
Ratio per mille of population					18·47	2·37	2·66

The statement shows that the cholera of the year was most fatal during the two periods of maximum and minimum rainfall. The total rainfall for the year, it is stated, was above the average for the past fifteen years, "but it was preceded and followed by abnormal drought." During March the weather was unusually dry and hot, the average temperature being 5° above that of the same month in 1880; and about the time that cholera commenced "there was a great storm, which prostrated many trees and broke

down houses." In Gauhati town, it appears, the great mortality was in June, 61 deaths and 11.38 inches rainfall registered, and in October, 64 deaths and 1.09 inches rainfall registered. The increased activity of the disease in May was coincident with the first heavy rainfall after an unusually prolonged drought. On the 29th May, it is stated, cholera was severely prevalent in the Athgaon quarter of the town, close to and on the south-eastearn side of the jail. "This region contains a number of tanks having more or less filthy water. It is covered with clusters of houses, damp and hidden among bamboo and plaintain clumps, and shut out from the influences of sunlight and free-air currents." On the 10th June there was a severe outbreak in the Silsakhar quarter, "on the north or right bank of the river, where, by the subsidence and unusual recession of the river, a pool of stagnating and very foul stretch of water was left as the nearest and readiest supply at hand. The river also receded from the south bank, but left no stagnant stretch of water for common use. In South Gauhati the people occupying the high ground near the river enjoyed practical immunity." The civil surgeon reported that the disease "was most prevalent and fatal in those regions of the town away from the river's bank, where the most accessible or only supply of water was from filthy sources;" and the Deputy Commissioner reported "that cholera first attracted notice in a part of the town near a tank in which the water had nearly dried up." This tank, it appears, "had not been dug deep enough to contain a constant supply, and in the middle and latter end of May, when the heat was excessive, the river unusually low, and the hollows near the town in an extraordinary state of desiccation for the season of the year, this shaped-out tank held but a shallow and weedy body of water." In the jail an isolated case of cholera occurred on the 6th April, and on the 6th June an outbreak commenced which lasted until the 30th of the month; there were 15 cases and 9 deaths. The circles in this district which suffered most severely were those of Gauhati, Kamalpur and Hajo, and Nulbari. In the Gauhati circle the cholera deaths registered amounted to 352, or at the rate of 4.22 per mille of population. This division of the district "consists of low-lying flat land, much of it below the flood-level of the Brahmaputra, with a long chain of swamps, which nearly surround the town on the south side, and which have been partly drained by the scheme in hand by the Department of Public Works." In the Kamalpur and Hajo circle the cholera deaths were 733, or 6.33 per mille of population. The area of this circle is described as very low-lying, and much of it below the flood-level of the Brahmaputra; "extensive swamps abound, with vast tracts covered with dense, rank jungle." In the Nulbari circle the cholera deaths were 405, or 2.42 per mille of population. Much of this area is described "as free of jungle, open, and on high ground, and well watered by numerous hill-streams." In this circle cholera deaths were registered in every month of the year; but it is reported that the disease existed "over at least one-half of the district throughout the year, and although the disease periodically subsides, it probably never disappears."

In Nowgong district the cholera deaths registered were 730 against 538 in 1880. The distribution of the deaths and the rainfall in inches, by months and by quarters, is shown in the subjoined statement:—

Months.	Cholera Deaths.	Quarters.	Rainfall. Inches.	Quarters.
January	41		0·06	
February	6	52	0·64	3.82
March	5		3·12	
April	15		5·42	
May	5	142	6·95	30·72
June	122		18·35	
July	217		18·89	
August	78	349	15·49	47·76
September	54		13·38	
October	18		0·61	
November	150	187	0·05	0·66
December	19		0·00	
Totals	730	730	82·96	82·96

From the above it appears that the course of the disease in 1881 was not arrested by the rainfall, as it usually appears to be; and this was probably the result of the long drought which preceded the rains having produced a condition of the soil different from that obtaining usually, and which counteracted the effects of the seasonal rains in checking the activity of evaporation. "In previous years," observes the civil surgeon, "the disease has appeared in an epidemic and virulent form before the rains set in, and ceased or become inactive on their being established." Regarding the life conditions of the people, it is stated that they—

"Live surrounded by every conceivable insanitary condition. Their huts are low and damp, and badly ventilated, and often so densely surrounded by jungle as to exclude both air and sun. Refuse matter of every description rots near their dwellings, and their water-supply, which is probably never pure, is not infrequently directly fouled and polluted. Every condition to favour the spread of the disease was ready at hand. The people make no attempt to arrest its progress; they even use their soiled articles of clothing and bedding without cleansing them; and their habits are such as would only tend to favour rather than arrest an epidemic either of cholera or any other disease."

Yet, notwithstanding these circumstances, considered to favour the spread of the disease, cholera did not appear in epidemic form until its natural season for activity arrived, and it did not continue after the season of its natural prevalence had passed away. The circles which suffered most severely were those of Nowgong and Roha. In the first there were 508 deaths registered, or 4.09 per mille of population; in the town of Nowgong only 20 deaths were recorded, and the civil station appears to have escaped altogether. In Roha 103 deaths from cholera were registered; and the disease followed the same seasonal course as in Nowgong, that is, it was active in January, subsided in February and March, revived in April and culminated in July, abated in August and subsided in October, and again revived in November and declined in December.

In Darrang district 231 cholera deaths were registered in 1881 against 59 in 1880. The disease prevailed only in the months from April to August inclusive, and again in October and November. In January and December only 2 deaths were registered in each month, whilst in February and March, and again in September, there was no record of cholera mortality. In the town of Tezpur only 5 cholera deaths were registered. In this district, "generally speaking, the villages are situated at a low level; and those, it is reported, that are not flooded during the rains are only raised above the rice-fields by accumulated filth and rubbish, and no practicable amount of drainage would make them dry or wholesome."

In Sibsagar district 759 cholera deaths were registered in 1881 against 490 in 1880. The disease, after a fitful course, interrupted by a lull in March, broke into epidemic activity in August, attained its maximum intensity in November, and commenced to decline in December, but was still in considerable activity at the close of the year. Of the 759 deaths, 156 were returned from Sibsagar circle, 271 from Jorhât, and 332 from Golaghat. In October there was a severe outbreak of cholera in the Majuli, on the north bank of the river. The disease first appeared there on the 26th September, in the village of Kamargaon, where there were 156 seizures and 80 deaths. Thence the disease spread to the village of Lokhor, in which there were 56 seizures and 37 deaths. There were 7 villages attacked, and the total of seizures reported was 263, with 161 deaths. Of the deaths, 30 were of males, 27 of females, and 104 of children. The civil surgeon who visited the locality reported that he found the villages in the Majuli "clean."

In Lakhimpur district only 53 cholera deaths were registered in 1881 against 262 in 1880. They occurred chiefly in May and June. In the town of Dibrugarh only 2 deaths were registered.

In Sylhet district 1456 cholera deaths were registered in 1881 against 732 in 1880. The disease does not appear to have prevailed with epidemic violence in any particular locality, but "appears to have sprung up here and there throughout the district." The cholera of 1881 in this district was a continuation of the epidemic of 1880, and, as has been mentioned in a previous passage, ran a different course from the cholera of the year in the districts of the Brahmaputra Valley. In Sylhet the year 1881 opened with cholera in full epidemic force in January; in February the disease received a check very distinctly marked, the deaths falling to 131 from 496 in January; in March the disease renewed activity, and in April attained a second maximum of intensity, represented by 282 deaths in that month; in May the disease commenced to abate, and in June suddenly subsided, the deaths in that month falling to only 16; in July there was a slight renewal of activity, which continued through the next month, and then the disease again suddenly subsided, but lingered on, with a few deaths in each month, until the end of November, when it again resumed activity, the deaths in December having risen to 52 from only 4 in the preceding month. The incidence of the disease in the four subdivisions of the district is shown by the death-rates for each. They are given as follows, per mille of population, viz.:—Sylhet, 0.24; Karimganj, 0.20; Sunamganj, 1.06; and Habiganj, 1.49. Dealing in his annual report with the history of epidemic cholera in this district, Dr. Mathew, the civil surgeon, observes—

"Whether it is from the absence of roads and those currents of traffic along roads to which cholera appears to cling, or from the annual submersion of vast tracts of country, by which the district is practically converted into an archipelago, epidemic cholera is rarely heard of. Looking back to my notes on this point for the last six years, I find it has invariably happened that as soon as the country becomes dry cholera makes its appearance, and remains until the inundations set in. With the dry season come reports of cholera from every direction. They are almost simultaneous from every point of the compass. It springs up like a plant of the season. Its progress cannot be mapped out and traced from place to place like a cholera epidemic in the North-Western Provinces. As soon as the rains have set in cholera as a rule disappears, or all but disappears. Unless, then, we suppose that a general combination has existed over a series of years among the chaukidars to report cholera mortality in the dry season only, it may be safely concluded that the endemic cholera of Sylhet is a disease of the dry season only."

In Cachar district only five cholera deaths were registered in 1881. In its chief town, Silchar, there was no record of the disease, and it is the only town in the province which escaped the cholera of this year.

The rainfall of 1881 was less than that of 1880 by about 9 inches, but it was still above (by about 2½ inches) the average fall for the province, and was proportionally distributed over the different seasons. The price of food, also, in this year was unusually cheap.

Summary Review.—In the series of tabular statements placed at the commencement of the preceding historical sketch of cholera in the Assam Province are exhibited the statistics of the incidence of the disease among the Native troops and jail populations during the successive years of the series of twenty dealt with in this inquiry, the mortality registered from the disease among the civil population for the successive years commencing with 1871, and the statistics of rainfall, by quarters as well as years, together with the average price of the staple food-grain for the entire series of years 1862 to 1881. In Table No. V. all these elements are exhibited together at one view. An examination of this table at first sight fails to discover any regular periodical rise and fall in the prevalence of cholera, such as has been observed to obtain in triennial cycles in the provinces previously described; but on careful scrutiny some similar periodicity of prevalence is distinctly traceable. In each of these provinces the first triennial cycle included within the series of years dealt with commences with the year 1863. This year showed cholera in Assam certainly epidemic so far as the statistics of the troops and jails go; but instead of being a fresh and stronger revival of the disease than that of the preceding year, it appears to have been of decidedly less force. In the next year, however, the second of the cycle, cholera abated very markedly, and this was in the normal course; but in the next year again, 1865, the last of the cycle, the disease, instead of subsiding into quiescence, as was to be expected in the normal course, prevailed with altogether excessive severity both among the Native troops and jail populations. Among the former the mortality was no doubt greatly aggravated by the unavoidable hardships and exposures to which the men were subjected in the Bhootan campaign; and among the latter, the privations and distress produced by almost famine rates for food no doubt operated in a similar manner to increase the cholera mortality of this year to the extraordinary high figure it attained, even exceeding that of the great epidemic year, 1862. It is to be observed, however, that this very severe cholera epidemic of 1865 was coincident with a season of abundant rainfall following upon a year of comparative drought, and with very high prices for food.

In the next triennial cycle, 1866–68, the first year shows a considerable epidemic activity of cholera; although, compared with the epidemic of the preceding year, its force was quite insignificant. It was coincident with a season of deficient rainfall, and with famine rates for food. Of the prevalence of the cholera of 1866 among the civil population we have no statistics; but if we take the incidence of the disease among the jail populations as an approximately fair indication, it must have prevailed among the general population with very considerable epidemic intensity, and probably as a newly revived epidemic of maximum intensity in the cycle according to the course normally due. In 1867 the statistics, so far as they go, show that the cholera of the year, instead of abating, as was to be expected in the normal course for this year of the cycle, was quite as severely prevalent as the disease of the preceding year. This unusual persistence in the activity of cholera in 1867 was coincident with a continued deficiency of rainfall, amounting to absolute drought, and with prices of food considerably cheaper than in the preceding year. This last favourable condition probably acted as an important factor in checking the violence of the epidemic by enabling the

people to resist its assaults more successfully than in the preceding year of famine distress, notwithstanding the otherwise unfavourable conditions of drought which operated to intensify the activity of the disease. In 1868, the last year of the cycle, cholera subsided to a minimum of prevalence, as was due in the normal course for the cholera of this year of the cycle. This abatement of the disease was coincident with an abundant rainfall following upon a year of severe drought, a sequence which in the case of the year 1865 was accompanied by greatly increased severity in the activity of cholera; but there is this difference to be observed in the conditions of the two years compared, viz., that in 1865 the increased cholera was accompanied with distress and privation from high prices of food, whereas in 1868 the abated cholera was accompanied with no such unfavourable conditions, food in this year being unusually cheap and abundant.

In the succeeding cycle, 1869–71, the first year is, in the normal course, one of newly revived epidemic cholera activity, and of considerable intensity of prevalence. This violence of the revived epidemic was coincident, as in the case of 1865, already referred to, with a season of very abundant rainfall following upon one of comparative drought, and with food at famine prices. In the next year, 1870, as due for this the second year of the cycle, there was a very marked abatement of cholera; and this great decline in the activity of the disease was coincident with an average rainfall following upon a year of unusually heavy rainfall, and with food comparatively cheap and plentiful. In 1871, the third year of the cycle, however, cholera, instead of still further subsiding into quiescence, as was normally due for this year of the cycle, prevailed with a considerable increase of activity, although with no great epidemic severity, judging from its incidence among the civil population, for whom the statistics of the disease are for the first time available in this year. Probably the cholera of 1871 in this province was really a cholera of minimum prevalence in the cycle as normally due. The conditions of weather and food-supply favoured its mild prevalence, the rainfall being much in defect, after a year of ordinary rainfall, and the prices of food continuing comparatively cheap.

In the next cycle, 1872–74, the first year shows a revived activity of epidemic cholera in the normal periodical course of the disease, though of much less severity than in the corresponding year of the preceding triennial cycle. As in the case of 1865, and again in that of 1869, the increased epidemic activity of cholera in 1872 was coincident with an unusually heavy rainfall following upon a year of comparatively severe drought; but food in this year was very cheap and abundant, whereas in the other two years mentioned it was very scarce and dear. This difference probably accounts for the lesser severity of the revived epidemic cholera of 1872. In 1873, the second year of the cycle, cholera abated very markedly in prevalence, as was normally due for this year of the cycle; and this abatement, as was the case also in the corresponding year of the two preceding triennial cycles, was coincident with a deficient rainfall, more or less great as compared with that of the year preceding, and with food comparatively cheap. The cholera of 1874, however, instead of declining still further, as normally due for this year of the cycle, prevailed with increased force and considerable epidemic severity. And this greatly increased prevalence of the disease was coincident, as was the case also with the cholera of the years 1865, 1869, and 1872, with a heavy rainfall following upon a year of greater or less drought, and with food at very high or famine rates, except in the case of the year 1872, in which food was cheap, and in which, also, the epidemic intensity of

cholera was greatly less severe than in the other years mentioned. It would appear, therefore, that the abnormally severe prevalence of the cholera of 1874 was owing to the operation of some fixed laws affecting the soil as influenced by rainfall, and affecting the public health as influenced by food-supply. In the one case changes of temperature and humidity of the air would be sudden and great, by reason of a rapid and excessive evaporation from a parched soil newly moistened, but not supersaturated; whilst in the other the standard of public health would be more or less seriously deteriorated by the privations and distress accompanying scarcity of food.

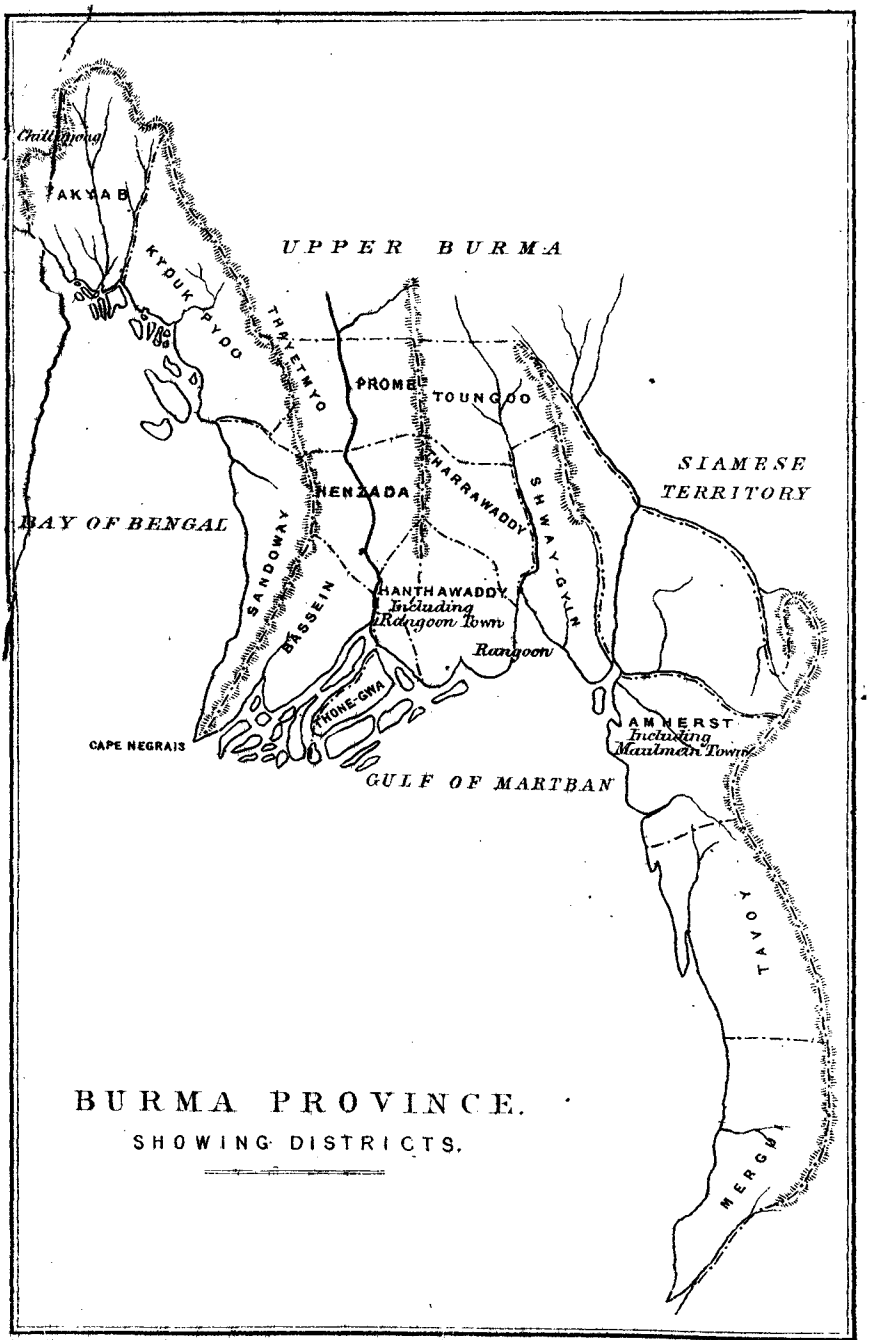
In the succeeding triennial cycle, 1875–77, the first year appears to have been one of considerable epidemic cholera activity, though the prevalence of the disease was markedly less severe than in the preceding year. The cholera of the year 1875 was probably a newly revived epidemic recurring in the normal periodical or cyclical course of the disease; and its intensity was not aggravated by unfavourable conditions of rainfall and food-supply, the former being of ordinary amount, and the latter, though still very dear, being somewhat cheaper than in the preceding year. In 1876, taking the returns for the troops and jails as the most accurate, there was a marked abatement of cholera; and this was in the normal course for this the second year of the cycle. The returns for the civil population show a distinct increase in the prevalence of the disease in 1876 as compared with 1875; and probably the disease, instead of abating among this class of the people, really was somewhat more prevalent in 1876 than in 1875, the conditions of the two years being much the same in respect to rainfall and food-supply, with, indeed, a somewhat greater dearness of food. In 1877, again, instead of the subsidence due in this year of the cycle in the normal course, there was a steady increase in the prevalence of cholera; and this increase was coincident with a defective rainfall following a year of somewhat less than average rainfall, and with a continued scarcity of food; the increase, however, was by no means severe, and altogether the character of the cholera of this cycle in the Assam Province was generally mild in contrast with the severity of the disease in Southern India during the same period, or even in the adjoining Province of Bengal.

In the next cycle, 1878–80, the cholera of the first year shows a very weak epidemic force for the revived activity normally due in this year, and altogether the intensity of the disease was markedly less than that of the preceding year. This decline in the prevalence of the disease in 1878 was coincident with an unusually heavy rainfall following upon a year of drought, and with food at famine rates; and this is contrary to what was observed to obtain under corresponding conditions of rainfall and food-supply in the years 1865, 1869, 1872, and 1874. The explanation which suggests itself to account for the anomaly is, that the rainfall of 1878 was so excessive as to supersaturate the soil, and thus check the rapidity of evaporation. It is to be noted, however, that the elements of rainfall in the years 1871 and 1872, and again in 1877 and 1878, bear a very striking general resemblance both as to amount and seasonal distribution, whilst those of the food-supply in the two periods differ greatly, the difference being greatly in favour of the earlier period in which the cholera was of the greater severity. All this is in contradiction of the idea that cholera is aggravated by the conditions of heavy rainfall following upon a season of drought, and by the accompaniment of famine during the course of a naturally recurring epidemic of the disease; and there is no explanation, apparently, to account for the different prevalence of cholera in the years compared under the similarity of the rainfall in both, more particularly as the year 1872, with its comparatively severe

cholera, was a year of cheap and abundant food; whereas 1878, with its comparatively mild cholera, was a year of very high prices and much famine distress. But whatever were the real causes which produced the abatement of the cholera of 1878, they were no longer operative in 1879; for in this year, the second of the cycle, cholera, instead of declining from the prevalence of the preceding year, as normally due, prevailed with very greatly increased intensity. This unusual violence of the disease was coincident with very abundant rainfall following upon a year, not of drought or deficient rainfall, as so often noticed before, but of even greater and exceptionally heavy rainfall; whilst, in respect to food-supply, prices were very much cheaper than in the preceding year, although still ruling high. Such was the case for the year, taken as a whole. But if we take the distribution of the rainfall by quarters, and compare this (see Table No. V.) with the monthly progress of cholera in 1879, as shown in Table No. II., we shall find that the intensity of the epidemic was in the first six months of the year, during which the first three months were characterised by very unusual drought, and the following three months by exceptionally heavy rainfall; thus assimilating the course of the cholera of 1879 to that which had been observed to obtain in the years 1865, 1869, 1872, and 1874, and confirming the idea of a fixed relation, as cause and effect, between rainfall following drought and increased cholera activity. This relationship is further remarkably confirmed by the experience of 1880. For if, as is asserted, the heavy rainfall after drought was a main cause that excited the abnormal activity of cholera in 1879 (aided by dearness of food), that cause had certainly ceased to operate in 1880, in which the rainfall was so distributed over the several quarters that there was no deficiency in either of them, but, on the contrary, an exceptionally heavy fall in the first quarter; and with this plentiful rainfall, coupled with unusual abundance and cheapness of food, the activity of cholera subsided in a very remarkable manner, and this subsidence occurred in the normal course as due for this year of the cycle.

In 1881, the first year of the triennial cycle 1881–83, cholera, as normally due in its periodic career, prevailed with a revived epidemic activity, although with no great severity of force. This comparatively mild activity of the disease was coincident with a rainfall more than 9 inches less than that of the preceding year, and with food unusually cheap and abundant.

The rainfall statements and cholera mortality given in Tables Nos. V. and II. respectively are worthy careful study and comparison, as they seem very clearly to show that heavy rainfall following drought is usually attended with increased activity of cholera.



BURMA PROVINCE.

SHOWING DISTRICTS.

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SECTION VIII.

BURMA PROVINCE.

Geographical Position.

BRITISH BURMA comprises the long strip of the Malay Peninsula lying between 9° 55′ and 20° 50′ N. lat. and between 92° and 99° E. long. It is bounded on the north by Upper Burma and Eastern Bengal, on the east by Karenni and the kingdom of Siam, and on the south and west by the sea. The divisions, districts, area, and population of the territory under British administration are shown in the annexed tabular statement. Including the Salwin tracts and Northern Arakan, the population in 1876-77 was estimated at 2,942,605, and the area in square miles at 88,556.

STATEMENT *showing Population, Area, and Density of Population in each District of the British Burma Province for the Year* 1872.

Divisions.	Districts.	Population (Census 1872).			Total of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Arakan.	Akyab . . .	154,000	135,703	289,703	490,662	5,337	13,313	56	37
	Kyoukphyou .	73,056	71,121	144,177		4,309		33	
	Sandoway . .	29,256	27,526	56,782		3,667		15	
Pegu.	Rangoon . .	213,380	164,704	378,084	1,810,848	4,258	25,964	92	70
	Thonegwa . .	108,856	102,119	210,975		5,413		41	
	Bassein . . .	154,683	142,833	297,566		7,047		45	
	Henzada . .	121,918	120,861	242,779		1,948		153	
	Tharawadi . .	120,671	119,694	240,365		2,014		122	
	Prome . . .	145,603	146,322	291,925		2,887		107	
	Thyetmyo . .	76,156	72,998	149,154		2,397		63	
Tenasserim.	Moulmain . .	150,842	133,650	284,492	650,786	15,203	42,084	20	15
	Tavoy . . .	39,846	40,656	80,502		7,150		12	
	Mergui . . .	27,681	25,115	52,796		7,810		7	
	Shwegyin . .	70,727	70,624	141,351		5,567		26	
	Toungoo . .	46,909	44,736	91,645		6,354		15	
Total of the province		1,533,584	1,418,712	2,952,296		81,361		37	

NOTE.—The population of Salwin is not included in the registration circles, to which the following returns apply.

Physical Aspects.

The province consists of a central portion—Pegu—which stretches inland for nearly 300 miles along the valley of the Irrawaddy River, and of two long strips of sea-coast—one on the north, Arakan, the other on the south, Tenasserim—each of which is shut off from the interior territory by a more or less continuous range of mountains.

Arakan, the most northern of the three divisions of the province, is a narrow seaboard strip, shut in on the east by the Arakan Yoma Mountains, and extending from the

Naaf estuary in the north to the Khwa River in the south. Owing to the vicinity of the boundary range, its rivers are only inconsiderable streams. "Of these, the principal are the Naaf estuary; the Mru River, an arm of the sea running inland more than 50 miles, and from 3 to 4 miles broad at its mouth; and the Koladan or Arakan River, rising near the Blue Mountain, in lat. 23° N., with Akyab, the chief divisional town, situated on the right bank, close to its mouth. The Koladan is navigable for 40 miles from its mouth by vessels of 300 or 400 tons burthen. Farther south the coast is rugged and perilous for ships, but studded with fertile islands, the largest of which are Cheduba and Ramri." The Arakan Yoma range of mountains separates the division from Chittagong on the north and from Pegu on the south, and from Upper Burma on the east.

Pegu, the central division of the province, is separated inland from the valley of the Salwin—included in the Tenasserim division—by the Pegu Yoma range of mountains. The principal river in Pegu is the Irrawaddy. In the British territory "its waters roll on in a south-south-west direction for 240 miles, when it empties itself by ten mouths into the sea. As it approaches the coast it divides into numerous branches, converting the lower portion of the valley into a network of tidal creeks." The other rivers in this division are the Hlaing or Rangoon, the Pegu, the Sittang, and the Bhileng; and there are some lesser streams. The Hlaing, after passing Rangoon, is joined by the Pegu and Puzundoung Rivers. "The two latter streams rise close together in the Yoma range, about 58 miles above the town of Pegu. They intercommunicate so frequently throughout the lower portion of the valley that they can hardly be pronounced distinct streams. The Rangoon River also communicates by more than one channel with the principal delta branch of the Irrawaddy." The Sittang River is joined by the Shwegyin River below the town of that name; it then gradually widens, "and after a backward curve, it issues through a funnel-shaped basin into the Gulf of Martaban, spreading so rapidly that it is difficult to distinguish where the river ends and the gulf begins." The Bhileng River enters the Gulf of Martaban between the Salwin and Sittang Rivers. "The valleys of the Irrawaddy and the Sittang unite towards their mouth to form an extensive plain, stretching from Cape Negrais to Martaban—the most productive portion of the whole province."

Tenasserim, the southern division of the province, has two principal rivers, the Salwin and the Tenasserim. The former enters the sea at Moulmain, but owing to numerous rapids and rocks it is navigable for only a few miles from that town. The latter flows past the town of Tenasserim, which gives its name both to the river and the division, and enters the sea by two mouths, the northern channel being navigable by boats for about 100 miles.

The province is traversed from north to south by three chief ranges of hills. "To the west is the Arakan Yoma, a truncated and stunted prolongation of the great multiple congeries of mountains which start from the Assam chain. Seven hundred miles from its origin in the Naga wilds it sinks into the sea by Cape Negrais." The Pegu Yoma is the range which separates the Sittang from the Irrawaddy valley. At the head of the delta "it branches out into several low terminal spurs, the extremity of one being crowned by the cathedral of Buddhism, the great temple-shrine of Shwe-Dagon." The Sittang and Salwin valleys are divided by the Pounglong range, a meridional chain, some of the peaks of which, in the neighbourhood of Toungoo, reach an altitude of more than 6000 feet. "The Tenasserim Hills may be regarded as a prolongation of this range. They form the boundary between our territory and Siam."

"The lakes in the province would be more properly entitled lagoons, and there are few of any importance. The best known is the Kan-daw-gyi, or Royal Lake, near Rangoon. The Thú Lake, in the Henzada district, is 9 miles round and 2½ across; and there are two lakes in the Bassein district, each about 5 miles in circumference. A canal connects the Pegu and Sittang Rivers."

The country throughout the delta is flat and uninteresting. "Towards Prome the valley of the Irrawaddy contracts, and the monotony of the plain is diversified by a wooded range of hills, which cling to the western bank nearly all the way to the frontier. The Salwin valley contains occasional harmonies of forest, crag, and mountain stream; but they bear the same relation to the sublimity of the Himalayas as the Trossachs to the Alps. On the other hand, the scenery in Tavoy and Mergui, and among the myriad islets which fringe the Tenasserim coast, is almost English in its verdure and repose. A large part of the province is covered with forests, most of them reserved by the state. The teak plantations lie in the Rangoon division."

The climate of Burma is moderate and equable. In 1876 meteorological observations were taken at thirteen stations in the province. "The rainfall varied from a total of

230 inches in the year at Sandoway to 43 at Prome, the general average being about 130 inches. The great Indian rain-belt, stretching south from the Himalayas along the Bay of Bengal, includes all the sea-board and delta of the province, but the more inland stations are comparatively dry. The greatest heat is during March and April. It ranged from 102° F. at 4 P.M. in the shade at Thyetmyo to 85° F. at Akyab. The lowest minimum at 10 A.M., viz., 53° F., occurred at Toungoo in January. The thermometric mean range is inconsiderable, varying from 25° at Thyetmyo to 14° at Tavoy."

Agriculture.

Rice is the main crop raised in the province. In 1876 rice covered more than six-sevenths of the total area—2,883,820 acres—under cultivation. It is sown in June, transplanted in September, and reaped about December or January. "The Irrawaddy valley furnishes about three-fifths of the whole rice produce of the country. The main river runs direct to a point about 80 miles from the sea, with lower stretches of land on either side intersected by tributary streams. The whole of this space is annually inundated, and it is scarcely exaggeration to state that an inch or so of water frequently determines whether the receding flood will leave a bright fruit-laden plain or a sterile waste of ruined green. The Henzada and Bassein districts have been partially secured by an extensive series of embankments which fringe the right bank of the Irrawaddy and the left bank of the Nga-wun River for nearly 200 miles."

Cholera History, Statistical and Descriptive.

In the following series of tabular statements, Nos. I. to VI., are exhibited, in uniformity with the corresponding tables furnished with the historical account of the disease in the other provinces of British India, the statistics of cholera mortality for the troops and jail populations, and, so far as available, for the civil population also, together with the rainfall records, during the period of twenty years dealt with in this inquiry. Regarding the average price of the staple food-grain, rice, no information has been found available.

No. I.—STATEMENT *showing the Annual Total Deaths Registered from Cholera among the Civil Population in each of the Districts of the British Burma Province from the Year* 1871 *to* 1881 *inclusive.*

Districts.	Total Cholera Deaths Registered among the Civil Population in the Years										
	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Akyab . . .	...	524	11	79	7	900	1,340	853	220	116	18
Kyoukphyou .	...	11	...	...	...	696	732	643	213	10	...
Sandoway . .	...	25	...	1	...	110	285	22	11	...	...
Rangoon . .	...	39	2,252	207	225	99	466	1,183	75	259	196
Thonegwa . .	...	...	...	...	206	260	611	722	260	422	499
Bassein . . .	37	8	1,393	135	120	220	654	694	256	157	376
Henzada . .	69	15	1,575	87	55	501	663	166	35	95	1,234
Tharawadi .	...	...	...	...	...	...	...	693	67	389	276
Prome . . .	6	...	593	5	10	611	937	751	61	944	776
Thyetmyo . .	20	13	920	7	...	86	203	88	204	99	1,187
Moulmain . .	8	5	764	187	111	109	664	367	28	11	402
Tavoy . . .	2	...	59	74	25	77	70	6	66	...	19
Mergui . . .	...	...	...	46	...	...	423	26	301	...	9
Shwegyin . .	...	...	217	125	2	...	117	401	31	136	243
Toungoo . .	20	...	325	7	...	18	111	144	...	...	4

NOTE.—From Thonegwa no returns were received until 1875, and from Tharawadi until 1878.

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the British Burma Province for the Twenty Years* 1862 *to* 1881.

Years.	Cholera Deaths registered in the Months of												Totals			Ratio per Mille of Population.	Rainfall in Inches and Cents.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera active in the Pegu division.															...	No information.
1863	Cholera active in the Pegu and Arakan divisions.															...	
1864	Cholera prevalent widely in the Pegu and Tenasserim divisions.															...	
1865	Cholera epidemic over the province generally.															...	
1866	Cholera prevalent in the Arakan and Pegu divisions.															...	
1867	Cholera prevalent in the Pegu division.														281	...	
1868	Cholera prevalent in the Pegu and Northern Tenasserim divisions.														207	...	
1869	Cholera more or less severely epidemic in the Arakan division.														11,864	4·01	132·46
1870	Cholera epidemic during latter half of the year.														2,383	0·96	128·46
1871	34	33	71	5	1	9	...	4	2	1	1	1	101	61	162	0·07	157·63
1872	16	16	121	141	103	75	112	34	13	7	2	...	418	222	640	0·24	124·07
1873	173	867	1,056	1,137	784	611	1,148	1,247	361	235	195	295	4,556	3,553	8,109	2·99	127·29
1874	358	178	93	112	90	44	62	3	4	2	7	7	580	380	960	0·35	115·80
1875	1	...	8	25	18	30	39	3	2	...	29	606	435	326	761	0·26	144·50
1876	256	119	558	645	56	676	308	248	401	104	91	225	2,220	1,467	3,687	1·28	118·15
1877	447	472	671	725	674	355	832	740	645	662	589	464	4,311	2,965	7,276	2·47	140·80
1878	573	396	340	391	457	593	1,071	617	491	507	742	581	4,121	2,638	6,759	2·28	104·89
1879	445	330	194	171	115	105	175	109	61	32	31	60	1,048	780	1,828	0·59	133·97
1880	163	116	91	37	5	7	4	1	91	602	887	634	1,580	1,058	2,638	0·85	134·62
1881	417	139	105	226	346	285	1,452	1,634	212	61	69	293	2,925	2,314	5,239	1·42	139·04
Totals and Means	2,883	2,666	3,308	3,615	2,649	2,790	5,203	4,640	2,283	2,213	2,643	3,166	22,295	15,764	52,794	1·36	130·89

NOTE.—The cholera deaths in 1867 and 1868 are the numbers registered in eighteen chief towns only.

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the British Burma Province in Inches and Cents. for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	RAINFALL IN INCHES AND CENTS. IN THE MONTHS OF												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	No information.												?
1863													?
1864													?
1865													?
1866													?
1867													?
1868													?
1869	0·05	0·22	0·08	2·01	8·97	37·77	30·74	24·42	18·30	8·94	0·83	0·13	132·46
1870	0·19	0·51	0·21	2·44	17·64	19·82	34·98	26·30	17·72	7·50	1·15	0·00	128·46
1871	0·00	0·96	1·39	0·82	21·19	37·39	32·03	27·89	23·67	11·95	0·24	0·10	157·63
1872	0·05	0·16	0·23	0·92	11·75	24·85	30·15	29·13	17·87	7·76	1·18	0·02	124·07
1873	0·00	0·00	0·15	1·45	6·78	24·57	29·99	30·10	20·40	9·45	4·37	0·03	127·29
1874	0·10	0·27	0·86	1·72	12·43	22·83	14·97	34·41	13·14	14·05	0·92	0·10	115·80
1875	0·24	0.01	0·23	4·07	11·17	30·18	41·40	24·68	21·73	9·67	1·08	0·04	144·50
1876	0·04	0·06	0·14	1·55	11·23	19·66	37·76	19·46	19·30	4·60	4·19	0·16	118·15
1877	0·00	0·06	0·31	0·27	5·55	33·17	35·92	37·20	15·53	7·77	4·94	0·08	140·80
1878	0·08	0·09	0·49	0·90	8·34	24·59	15·79	19·17	17·98	14·59	2·41	0·46	104·89
1879	0·08	0·11	0·38	4·74	9·11	25·63	30·18	27·75	20·63	9·85	5·00	0·51	133·97
1880	0·23	0·03	0·68	5·87	12.10	28·92	33·44	26·23	20·27	5·80	0·71	0·34	134·62
1881	0·03	0·18	0·29	0·55	11·27	24·59	40·63	31·71	17·42	7·93	4·22	0·22	139·04
Means	0·08	0·20	0·42	2·10	11·35	27·19	31·38	27·57	18·77	9·22	2·40	0·17	130·89

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the British Burma Province, together with the Average Strength and Ratio of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Totals.			Ratio per Mille of Strength.	
		Cholera.			Cholera.			Cholera.			Cholera.			
	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Admissions.	Deaths.
1862	2,201	1	1	3,331	...	...	?	?	?	5,532	1	1	0·18	0·18
1863	2,150	35	21	2,737	...	...	?	?	?	4,887	35	21	7·16	4·30
1864	2,434	5	3	2,680	...	...	4,011	71	41	9,125	76	44	8·33	4·82
1865	1,739	8	4	2,565	2	1	3,871	99	47	8,175	109	52	13·33	6·36
1866	1,708	5	2	2,589	...	...	3,602	?	24	7,899	?	26	?	3·29
1867	1,600	2	1	2,569	3	2	3,521	6	3	7,690	11	6	1·43	0·78
1868	1,805	...	...	2,562	...	...	3,725	14	6	8,092	14	6	1·73	0 74
1869	1,615	14	5	3,304	...	...	4,167	122	61	9,086	136	66	14·97	7·26
1870	1,485	39	27	3,098	1	...	4,586	118	69	9,169	158	96	17·23	10·47
1871	1,819	...	...	3,048	...	...	4,413	...	...	9,280	...	...	...	...
1872	1,998	...	...	3,474	2	1	4,434	81	20	9,906	83	21	8·38	2·12
1873	1,974	23	12	3,597	2	2	4,821	203	97	10,392	228	111	21·94	10·68
1874	2,007	1	1	3,181	...	...	4,786	11	6	9,974	12	7	1·20	0·70
1875	1,957	1	...	3,420	...	...	4,734	10	5	10,111	11	5	1·09	0·49
1876	1,890	...	1	3,491	2	1	5,013	61	20	10,394	63	22	6·06	2·12
1877	1,777	10	6	2,720	1	1	4,778	160	83	9,275	171	90	18·44	9·70
1878	1,793	9	6	2,517	3	3	4,748	189	120	9,058	201	129	22·19	13·14
1879	2,742	35	23	3,900	33	18	4,410	2	2	11,052	70	43	6·33	3·89
1880	2,605	1	1	4,239	...	...	4,659	17	6	11,503	18	7	1·56	0·61
1881	2,676	5	4	3,091	1	...	4,627	70	38	10,394	76	42	7·31	4·04

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the British Burma Province for the Twenty Years from 1862 to 1881.*

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	2,201	635	0·16	100	3,331	...	...	...	?	?	?	?
1863	2,150	606	5·77	60	2,737	...	...	...	?	?	?	?
1864	2,434	953	0·52	60	2,680	...	...	...	4,011	2,600	2·73	58
1865	1,739	597	1·34	50	2,565	615	0·32	50	3,871	3,409	2·90	47
1866	1,708	565	0·88	40	2,589	...	...	...	3,602	2,956	?	?
1867	1,600	534	0·37	50	2,569	704	0.43	67	3,521	280	2·14	50
1868	1,805	...	...	...	2,562	...	...	...	3,725	1,633	0·86	43
1869	1,615	1,615	0·86	36	3,304	...	...	...	4,167	3,067	3·98	50
1870	1,485	1,145	3·40	69	3,098	643	0·15	...	4,586	3,071	3·84	50
1871	1,819	...	...	...	3,048	...	...	...	2,772	837	0·48	50
1872	1,998	...	...	...	3,474	184	1·09	50	4,434	2,031	3·99	25
1873	1,974	1,015	2·26	52	3,597	588	0·34	100	4,821	4,047	5·02	48
1874	2,007	692	0·14	100	3,181	...	...	...	4,786	3,032	3·63	54
1875	1,957	476	0·21	...	3,420	...	...	...	4,734	3,057	0·33	50
1876	1,890	?	?	?	3,491	849	0·24	50	5,013	4,279	0·42	33
1877	1,777	578	1·73	60	2,720	816	0·12	100	4,778	3,933	4·07	52
1878	1,793	1,793	0·50	67	2,517	1,720	0·17	100	4,748	3,441	5·20	63
1879	2,742	1,479	2·37	66	3,900	2,643	1·25	54	4,410	1,525	0·13	100
1880	2,605	1,404	0·07	100	4,239	...	...	...	4,659	2,170	0·78	35
1881	2,676	1,270	0·39	80	3,091	676	0·15	...	4,627	3,396	2·06	54

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera as represented by the Death-rates registered among the Troops and Jails, and among the Civil Population, of the British Burma Province for the Twenty Years from 1862 to 1881 inclusive, together with the Average Rainfall.* (*The Average Prices of the Staple Food-grain in this province are not available.*)

Years.	Cholera Death-rate per Mille of Strength or of Population.					Average Rainfall in Inches and Cents.					Average Price of the Staple Food-grain.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Population.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	0·45	...	?	0·18	No information.	Information not available.					Information not available.
1863	9·77	...	?	4·30							
1864	1·23	...	10·22	4·82							
1865	2·30	0·39	12·14	6·36							
1866	1·17	...	6·66	3·29							
1867	0·62	0·79	0·85	0·78	0·85						
1868	...	...	1·61	0·74	0·50						
1869	3·09	...	14·64	7·26	4·01	132·46	0·35	48·75	73·46	9·90	
1870	18·18	...	15·04	10·47	0·96	128·46	0·91	39·90	79·00	8·65	
1871	...	...	...	...	0·07	157·63	2·35	59·40	83·59	12·29	
1872	...	0·29	4·51	2·12	0·24	124·07	0·44	37·52	77·15	8·96	
1873	6·08	0·55	20·12	10·68	2·99	127·29	0·15	32·80	80·49	13·85	
1874	0·50	...	1·25	0·70	0·35	115·80	1·23	36·98	62·52	15·07	
1875	...	...	1·06	0·49	0·26	144·50	0·48	45·42	87·81	10·79	
1876	0·05	0·29	3·99	2·12	1·28	118·15	0·24	32·44	76·52	8·95	
1877	3·38	0·37	17·37	9·70	2·47	140·80	0·37	38·99	88·65	12·79	
1878	3·35	1·19	25·28	13·14	2·28	104·89	0·66	33·83	52·94	17·46	
1879	8·39	4·61	0·45	3·89	0·59	133·97	0·57	39·48	78·56	15·36	
1880	2·38	...	1·29	0·61	0·85	134·62	0·94	46·89	79·94	6·85	
1881	1·49	...	8·21	4·04	1·77	139·04	0·50	36·41	89·76	12·37	

No. VI.—STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the British Burma Province for the Years* 1869 *to* 1881 *inclusive.*

Years.	Districts and Stations.												
	Akyab.	Kyoukphyou.	Sandoway.	Rangoon.	Bassein.	Henzada.	Prome.	Thyetmyo.	Moulmain.	Tavoy.	Mergui.	Shwegyin.	Toungoo.
1869	183·96	167·15	191·35	106·95	86·46	76·43	59·30	49·49	189·85	190·55	165·40	183·10	72·02
1870	178·32	156·60	236·03	78·80	86·10	76·43	45·80	41·60	185·10	185·65	151·10	183·80	64·70
1871	211·70	193·10	229·90	143·40	93·40	86·80	62·90	54·60	245·85	229·90	194·40	201·90	101·30
1872	180·39	160·70	195·10	112·50	73·70	65·50	71·80	58·10	183·40	166·70	135·40	137·80	71·90
1873	141·97	151·70	229·80	131·10	108·30	70·20	88·30	42·95	212·85	166·70	135·80	114·10	61·00
1874	141·97	165·35	148·55	69·05	69·00	64·70	27·75	50·40	207·00	210·42	148·22	142·00	61·00
1875	184·84	220·50	230·40	79·30	114·20	94·95	43·90	58·80	224·55	229·90	132·00	172·10	93·05
1876	160·31	143·77	153·40	98·01	103·50	74·34	51·37	39·28	185·95	175·92	172·74	112·48	64·88
1877	177·34	228·42	249·58	101·44	132·65	81·64	59·84	62·55	164·26	206·82	136·06	152·14	77·70
1878	161·01	164·64	127·06	83·63	91·08	62·53	47·65	36·00	134·14	159·51	143·22	92·09	61·10
1879	227·24	171·03	191·42	113·69	99·66	81·46	49·71	40·22	171·26	221·11	163·66	134·83	76·33
1880	191·31	197·45	212·18	92·01	109·21	82·14	46·49	39·00	199·48	214·85	157·51	120·04	88·40
1881	198·74	211·01	204·91	102·09	112·20	82·82	42·84	46·01	205·88	189·71	181·67	141·87	87·86

NOTE.—For the districts of Thonegwa and Tharawadi there is no information of rainfall. The rainfall for 1869 for Rangoon, Bassein, Prome, Thyetmyo, and Toungoo is the average of the five years 1870 to 1874. The rainfall for 1869 and 1870 for Henzada is the average of the five years 1871 to 1875.

I now proceed to describe the history of cholera in each year of our series in order of succession.

1862.—There are no statistics of the prevalence of cholera among the civil population of British Burma until the year 1869, and the record of the monthly prevalence of the disease is available only from the year 1871. For the troops and jails the statistics are more or less complete for the whole series of twenty years.

The rainfall statistics are available only from the year 1869.

In 1862 cholera is known to have prevailed actively in the Pegu division of the province, but the other divisions appear to have more or less entirely escaped the epidemic visitation of the disease.

Among the European troops, total average strength 2201, there was only one admission and one death from cholera in 1862, giving a death-rate of 0.45 per mille of strength. It occurred at Thyetmyo, strength 635, in November.

Among the Native troops, total average strength 3331, there was no cholera recorded in 1862.

Among the jail populations; there are no statistics to show the prevalence of cholera during 1862 among this class.

1863.—There appears to have been an epidemic revival of cholera activity in this province during 1863. The disease prevailed with some severity in the Pegu and Arakan divisions.

Among the European troops, total average strength 2150, there were altogether 35 admissions and 21 deaths from cholera, giving a death-rate of 9.77 per mille of strength. They all occurred at Thyetmyo, strength 606, and of the 35 admissions, there were 1 in January, 3 in March, 22 in April, and 9 in May.

Among the Native troops, total average strength 2737, there was no cholera recorded in 1863.

Among the jail populations there are no statistics to show the prevalence of cholera in 1863. It appears, however, that the disease was prevalent in the Akyab jail in this year. The medical officer, reporting on this jail to the Inspector-General of Prisons, British Burma, in 1865, writes—"The year 1862 was an unaccountably healthy year; diarrhœa, dysentery, and cholera well nigh disappeared altogether, but returned with some severity in 1863, raising the mortality from 2.6 to 13 per cent. Deducting the mortality from cholera, however—4.7—8.3 falls to other diseases; and when we consider the prevalence of collateral affections during a cholera epidemic, this does not appear excessive." The average strength of the Akyab jail in 1863 is given at 444, and the cholera mortality of 4.7 per cent. on this strength gives the total number of cholera deaths at 20. Regarding the other jails in this province there is no information available in respect to cholera.

Regarding the outbreak of cholera among the European troops at Thyetmyo, it is recorded (in reference to the outbreak of the disease in 1869 in the same station) that the station lies in a shallow basin. "The Native infantry is located on the best ground, namely, on a plateau along the edge of the basin; while the Royal Artillery and European infantry are on the worst, *i.e.*, in the bottom of the basin." The superiority of the site of the Native infantry barracks, and the comparatively low situation of the existing European barracks, it is pointed out, "can best be judged of by crossing the river and looking down on Thyetmyo from the high ground about Allanmyo and Yuatoung, directly opposite." The European barracks are situated near the river, which, being a navigable one for steamers, is the great, and only, highway of traffic between Upper and Lower Burma. In the outbreak of 1863 the surgeon of the third battalion 60th Rifles and another officer died of the disease, which "was principally confined to the range of barracks nearest to the river-bank, and to the European troops living in those buildings. The Native cantonment was not at all affected."

1864.—In this year cholera was widely prevalent in the Pegu and Tenasserim divisions. Among the European troops, total average strength 2434, there were altogether 5 admissions and 3 deaths from cholera, giving a death-rate of 1.23 per mille of strength. Of the 4 stations occupied by these troops in 1864, the 2 following recorded cholera, viz.:—Toungoo, strength 461, admissions 4 and deaths 2; and Shwegyin, 492, 1 and 1 respectively. Of the 5 admissions, there were 3 in January and 2 in February.

Among the Native troops, total average strength 2680, there was no cholera recorded in 1864.

Among the jail populations, total average strength 4011, there were altogether 71 admissions and 41 deaths from cholera, giving a death-rate of 10.22 per mille of strength. Of the 14 jails in the province, the 3 following recorded cholera in 1864, viz.:—Prome, strength 265, admissions 9 and deaths 5; Rangoon, 901, 2 and 1; and Moulmain, 1534, 60 and 35 respectively. The dates of the admissions and deaths are not traceable in the records. Regarding the Moulmain jail, the medical officer, in his annual sanitary report for 1864, writes—"The prisoners have suffered severely from sickness during the year. . . . The diseases from which they have suffered and died have been dysentery, diarrhœa, atrophy, and gangrenous ulcers. . . . In the months of April and May cholera, in a sporadic form, but of a very fatal type, visited the jail. Its seizures were not very extensive, considering the large number of prisoners in the jail, and although it extended over a long period of time, a considerable interval usually elapsed between each case. The prisoners were generally attacked with it while out at work on the roads

—very few during the night, or while within the jail walls; in fact, I remarked that no cases were ever admitted on Sundays—a circumstance which led me to connect the outset of the disease to drinking large quantities of perhaps stagnant water near places where they were at work. . . . At the time the disease prevailed among the prisoners, its seizures were extremely common and very fatal among the natives in the town."

Regarding the one death from cholera in the Rangoon jail, it is stated that it occurred on the 22d November, among a gang of 250 transport prisoners, who had been landed for a day or two of rest from the steamer *Arracan* from Calcutta, *en route* to the Andamans. Of the 250 who had been landed and received in the jail enclosure, ten were in hospital on the 19th November when inspected by the Inspector-General of Prisons, and, besides these, eleven had been left on board, being "thought too weak to bear removal on shore." These were inspected, also on the same day, by the Inspector-General of Prisons, who writes in this connection:—"One man, who was dying of choleraic diarrhœa, had been placed with his body slanting conveniently towards a scupper-hole." No case followed the death from cholera in the jail on the 22d November.

1865.—In this year cholera prevailed as an epidemic over the province generally, and apparently with considerably greater severity than in the preceding year.

Among the European troops, total average strength 1739, there were altogether 8 admissions and 4 deaths from cholera, giving a death-rate of 2.30 per mille of strength. They all occurred at Thyetmyo, strength 597. Of the 8 admissions, there were 2 in May, 2 in July, 1 in October, and 3 in December.

Among the Native troops, total average strength 2565, there were altogether 2 admissions and 1 death from cholera, giving a death-rate of 0.39 per mille of strength. They occurred at Toungoo, strength 615. Of the 2 admissions, 1 was in March, the other in May.

Among the jail populations, total average strength 3871, there were altogether 99 admissions and 47 deaths from cholera, giving a death-rate of 12.14 per mille of strength. Of the 15 jails in the province, the 7 following recorded cholera in 1865, viz.:—Moulmain, strength 1396, admissions 30 and deaths 16; Myanoung, 33, 1 and 0; Akyab, 419, 4 and 4; Rangoon, 941, 1 and 1; Prome, 258, 45 and 20; Toungoo, 70, 2 and 1; and Kyoukphyou, 292, 16 and 5 respectively. The dates of the admissions and deaths are not traceable in the records; but the months in which the disease and deaths occurred in the several jails are stated as follows:—In Moulmain, February and March; Myanoung, November and December; Akyab, September; Rangoon, November; Prome, March and April; and Toungoo, November.

Regarding the outbreak in the Moulmain jail, it is stated that cholera and smallpox, "although raging epidemically in the town, appeared among the prisoners only in a sporadic form." At Prome also both these diseases raged at the same time, and cholera "was epidemic at Prome in February 1865, and so continued till April following, many people dying of the disease." Regarding the cholera in Akyab jail, it is recorded that the first death occurred on the 22d and the last on the 28th September. "There were just 4 cases and 4 deaths, which is unusual. The patients were all strong Arakanese, and comparatively young, being aged respectively 40, 36, 28, and 45 years." In Toungoo, it is stated, cholera "was prevalent in the town during November and December, and did not attack any of the

inmates in the jail until late in December, when it did not assume an epidemic form. It is also stated that the prisoners, besides being employed by the Public Works Department, and in making roads during the year, were also employed in the town. "All the drains in the town were thoroughly cleaned and kept clean by the prisoners, particularly during the prevalence of cholera in the town . . . None of the working gang of prisoners were attacked with cholera. The two prisoners who were attacked were under trial, and had been inside the jail for several months."

1866.—Compared with the preceding year, the returns, so far as they go, show that the cholera of 1866 prevailed with abated severity, but still with considerable epidemic activity, in the Arakan and Pegu divisions.

Among the European troops, total average strength 1708, there were altogether 5 admissions and 2 deaths from cholera, giving a death-rate of 1.17 per mille of strength. They all occurred at Thyetmyo, strength 565, and all during the first quarter of the year.

Among the Native troops, total average strength 2589, there was no cholera recorded in 1866.

Among the jail populations, total average strength 3602, the number of admissions is not traceable in the records; but the deaths from cholera are stated at 24, giving a death-rate of 6.66 per mille of strength. Of the 14 jails in the province in this year, the 5 following recorded cholera, viz.:—Rangoon, strength 946, deaths 4; Moulmain, 1085, 6; Akyab, 365, 10; Kyoukphyou, 285, 2; and Prome, 275, 2, respectively. The monthly distribution of these deaths is not traceable.

It is recorded, in connection with the cholera deaths in Akyab jail, that there was a severe cholera epidemic in the town. "During the month of April 1866 the disease appeared amongst the prisoners, and ten men died of it. The sickness and mortality in the town of Akyab itself was so great from this cause at the same time that the natives in the district dreaded to come to Akyab." Regarding the general sickness in the Kyoukphyou jail, the medical officer of the jail attributed it "to the epidemic character of the season," and writes that "some of the prisoners took a fever dependent on malignant malarious origin." Regarding the appearance of the disease in the Moulmain jail, it is recorded that "cholera made its appearance during the early months, but it was more of a sporadic type." In this jail there were 10 admissions and 6 deaths from cholera in 1866.

Regarding the seasons in 1866, the medical officer at Toungoo writes—"The past year has been in some respects an unusual one; the hot season commenced early, and was more intense than it generally is, the maximum registered temperature being 106° in the shade. The monsoon commenced late, and was scanty; only 74 inches of rain fell, a considerable difference when contrasted with that of last year. The crops, however, did not suffer, as there was no actual drought."

1867.—In this year there was a decided abatement in the prevalence of cholera as compared with the experience of the preceding year, and apparently the disease was confined almost wholly to the Pegu division.

During this year the registration of deaths among the civil population was introduced in the chief towns of the several districts, and in 1869 was extended over the province generally. In 1867 the following of the 17 towns under registration, and with an aggregate population of 288,740, recorded cholera, viz.:—Akyab, 1 death; Rangoon, 17; Bassein, 14; Prome, 174; Myanoung, 56; and Thyetmyo, 19. All these deaths occurred between the early part of October and the end of December. During 1867 cholera

prevailed throughout the Prome district and over the Pegu division generally, the Arakan and Tenasserim divisions remaining more or less wholly exempt from the disease.

It is recorded that in Rangoon town, population 71,189, "cholera was sporadic in character, and visited its usual haunts, Yanbonguin, Bolatoung, and Puzundoung. It caused 17 deaths." These quarters are described as on low-lying land, and overcrowded by a poor "squatter" population.

In Thyetmyo town, population 8000, which the civil surgeon considers "one of the healthiest towns in Burma," and of which the "drainage is also good," cholera appeared in the last quarter of the year, and "proved fatal to 19 persons between the 12th October and 9th December 1867." The type of the disease "was very mild, and of those attacked the larger number recovered."

In Prome town, population 23,420, cholera prevailed as an epidemic also in the last quarter of the year. The first case appeared on the 29th October, and there were altogether 145 deaths from the disease in Prome itself, the last being on the 20th December, and the greatest number in any one day (10) having occurred on the 13th November. In the district the disease is said to have travelled "from north to south, following the left bank of the river. It came from where it nearly always does come in this country—down the Kyendwen River from the direction of Manipur." In the Chief Commissioner's "Memorandum on the Public Health Report for 1867" it is stated, in reference to this outbreak of cholera—

"Prome was originally the most unhealthy town in the province, principally, if not entirely, owing to the fact of its being excessively swampy, and having round it a broad, deep, and most offensive ditch, excavated years ago by the Burmese. At this time, 1867, a plan was under consideration for filling up the ditch round the town."

The annual rainfall at Prome averages, it is stated, 70 inches. "This amount, so much greater than at Thyetmyo, 50 miles to the north, where it is only 42 inches, and at Myanoung, about 50 miles to the south, where it is 58 inches, is probably owing to the surrounding hills." The epidemic in the Prome district was preceded by one of smallpox. Both diseases are stated to have been "of a very mild type, and followed each other consecutively, the former (smallpox) occurring in the dry season and during the rains, the latter (cholera) at the close of the rains."

Both epidemics "were preceded and accompanied by marked and unusual changes in the periodicity of the seasons, to wit, a very dry, hot season, unusually early rains, and scanty fall, being 30 inches below that of the corresponding period of the previous year, and a peculiar absence of thunderstorms, and other electric conditions of the atmosphere."

The outbreak in the town of Prome, it is stated, "was preceded by very sultry and oppressive weather, and an unusually small quantity of rain for that season of the year." The cholera, it is stated, "appeared almost simultaneously both at Prome and Thyetmyo, as well as in some of the larger towns and villages throughout the district, and extended over a wide tract of country within a few days of its first outbreak." The principal towns attacked were those on the banks of the Irrawaddy, and the disease appears to have travelled from north to south through the district. Besides the 145 deaths in Prome itself, there were 29 recorded in Skwaydoung. No records were kept in the other towns, nor for the district. In Prome itself it is stated that "fevers, diarrhœa, and dysentery have been rife, as heretofore."

In Myanoung town, population 5598, which is "situated on a narrow strip of land having the Irrawaddy on the one side, and the low marshy

ground, with clayey absorbent soil, on the other," cholera made its appearance in the police lines, and caused 14 deaths. "The disease only confined itself to the police lines, and those living near escaped the infection." In this connection the civil surgeon reports—

"Generally the men enlisted for the police are those whose constitutional powers are below par from abuses and privations. A better class, I believe, cannot be got for the small wages allowed to these men. Cholera unhappily, at its appearance, selected these chiefly for its victims, and confined itself to the locality occupied by them, carrying away the weak and aged."

The police lines are thus described—

"The huts of the policemen are constructed by the side of and run parallel with the Bund. Some of them are situated scarcely a few yards from it. Running along the course of the Bund, on its either side, are deep excavations of considerable sizes, made at the time of constructing the Irrawaddy embankment; and these have been left without either being filled up or measures taken to empty them of the water of the periodical rains. The evaporation from these reservoirs is very slow, owing to the luxuriant vegetation with which they abound; and the stagnant accumulations, with organic matter in a state of decomposition, being actively at work, the stagnant atmosphere of these parts, as it is seldom renewed, becomes thereby loaded with exhalations given out from these sources; and the addition to this circumstance of the unwholesome air of the ill-constructed and badly ventilated huts has, in all probability, proved another and efficient cause of the disease."

The previously mentioned causes are thus cited by the civil surgeon—

"The exciting cause of the cases may be looked upon as depending on some peculiar influence of a heated atmosphere upon the system generally, already broken down by bad living and overwork, as the atmosphere for several days together before the attack was found to be very oppressive."

Cholera prevailed in several parts of the district also from the middle of November to the middle of December, generally showing itself in isolated cases. It appeared in the townships of Kyanghin and Yeagin Mingyi, and confined itself chiefly to the banks of the river. On the appearance of the disease in these townships, of which the former is situated on the western, and the latter on the eastern, bank of the Irrawaddy, medicines, with the following instructions among others, were sent to the local officials through the district authorities:—

"1. *Cleanliness.*—Remove the filth and rubbish from underneath your houses, and remove these away to a considerable distance, and have them buried in deep pits, and cover them with earth. 2. After the removal of the rubbish, &c., keep up slow fires burning underneath of those houses that are well raised from the ground, but where the houses are low, burn fire within the houses in earthen vessels for two or three hours daily. 3. After the fire is removed, sprinkle the flooring of the houses with a mixture of lime and water, and strew a mixture of lime and coarsely powdered charcoal underneath the houses from whence the rubbish, &c., was removed."

There is no record of the cholera deaths in this district, but in the other towns of Henzada district the following cholera mortality was recorded, viz., in Kyangin, population 7661, cholera deaths 15; in Henzada, population 14,320, deaths 6; and in Zaloon, population 3457, deaths 21.

In Bassein town, population 16,078, there was an outbreak of cholera in December. It caused 16 deaths in that month; and the disease lingered on in a sporadic form till the following March, up to the end of which month 30 deaths had been reported within the municipal limits. "Cases of choleraic diarrhœa were frequent during the outbreak." Cholera appeared at Rangoon in November; subsequently it appeared at Pantanan and Yangdun, and reached Bassein on 2d December, where it first made its appearance in

a squalid hovel on the bank of a muddy tributary to the river. On the 15th January it was heard of still farther to the west at Shangween, a village some 30 or 40 miles from Bassein; and then its course, which had been westerly throughout, deviated to the northwards at the foot of the coast range. The civil surgeon writes, in respect to the prevalence of the disease—"I have reason to think that the district suffered heavily on the course of its track." It is stated that in this year, 1867, as in the year 1865, the *cattle plague* was destructively prevalent, 4532 head of cattle having perished from it in 1867; not more than 10 per cent., the civil surgeon thinks, recovered when once attacked.

In Moulmain town, population 65,500, the public health was, it is stated, unprecedentedly good in 1867. The civil surgeon writes—

"In fact, I may safely say that of the eight years I have held the appointment of civil surgeon of Moulmain, the past year has far surpassed any previous one in point of exemption from ordinary disease, and also in the entire absence of epidemic disease. I can assign no reason for this salubrity, as there has been, apparently, no singularity in the character of the seasons, nor has there been any unusual attention bestowed on the sanitary condition of the town." As far as he was aware, "not a single case of cholera or any other epidemic disease has been reported during the year." Nevertheless he writes—"The fall of rain for the season, amounting to 197.85 inches, commenced in April and terminated in October, as usual. The amount of rainfall, though less by 49.60 inches than that of the preceding year, is a fair average compared with other years. The largest quantity of rain fell in September, viz., 63 inches, differing in this respect from other years, when the greatest fall took place either in July or August."

The following tabular statement exhibits the meteorological observations of the years:—

		1867.									1868.		
		Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Mean temperature.	Max.	94	93	86	84	85	85	91	89	87	86	87	89
	Med.	83	83¾	79	78	78	77	82	79	77	80	81	83
	Min.	74	76	74	75	74	75	76	70	63	67	75	75
Rainfall		1·70	21·95	32·40	32·95	38·70	63·35	5·70	0·60	...	...	...	...
Wind		S.W.							N.E.	N.E. and S.W.	N.E.		

It is stated that by far the most prevalent and fatal disease throughout the year 1867 "was fever of a remittent character, contracted in the malarious districts of the province by those whose calling it is to penetrate these unhealthy regions while in the prosecution of the timber trade. . . . Second to fever, in point of frequency and mortality, stand affections of the stomach and bowels, and of these there has been a marked decrease during the year under review."

In Akyab town, population 15,536, only a single death from cholera was reported in 1867, and there is no mention of the appearance of the disease in the district.

1868.—In this year there was a continued abatement of cholera, and the disease appears to have subsided to a minimum of prevalence, as was due in the normal course in this the last year of the triennial cycle 1866–68, in each year of which the periodic revival, abatement, and subsidence respec-

tively of cholera was according to the normal course. The incidence of the cholera of 1868 among the civil population is represented only by the deaths registered in the principal towns, as in the preceding year; in these the total of deaths was 207 against 281 in 1867, and the disease, though evidently less severely prevalent in the districts generally, was more widely diffused than in the preceding year. In 1867 cholera was confined almost entirely to the districts of the Pegu division; in 1868 it prevailed both in the Pegu and Tenasserim divisions; whilst the Arakan division appears to have remained more or less wholly exempt in both years, although a few cases of sporadic cholera occurred in Akyab town during the year, and diarrhœa and dysentery were common, and said to be somewhat intractable in the rainy months. A severe cyclone swept over the town and station of Akyab on the 13th November 1868, and caused very serious damage. "Hardly a house was left standing, and a large number of the beautiful trees which adorned the place were thrown down. Much injury was also done to the stores of grain. The cultivation near the coast in many places was completely destroyed by inundations from the sea." In the island of Cheduba, in the Arakan division, cholera, sporadic in character, was noticed; but it rapidly ceased. Smallpox and cattle plague were also observed in the vicinity of Kyoukphyou; and in this connection the Sanitary Commissioner writes—

"I have frequently observed that murrain, cholera, and smallpox are either met with contemporaneously in British Burma or they follow in each other's footsteps. Whether the same conditions are equally favourable to the spread or development of all these diseases, or whether there can possibly be any connection or affinity between their specific germs, I am, of course, unable to say. In Arakan more than one observer has noticed that these diseases seldom visit the country singly. I mentioned this subject in a paper submitted to Government when civil surgeon of Akyab as far back as 1862, and extended observations have confirmed all I then said."

The following particulars regarding cholera in 1868 appear in the Sanitary Report for British Burma for that year:—

In the town of Rangoon nine persons were attacked by cholera in the month of May in the Puzundoung quarter, "and, notwithstanding that a careful inquiry was made, the cause of the appearance of the disease could not be discovered."

This quarter of the town is situated on the banks of a creek subject to the rise and fall of the tide, and to the influence of the intense heat of the sun. On these banks is thrown a great quantity of waste from the rice-mills and winnowing-machines in this part of the town; and, writes the Sanitary Commissioner, "it occurs to me that the terrible effluvia from the decomposing broken rice and paddy husk lying on the banks of the creek may have had something to do with this 'sporadic' outbreak."

Of the 9 cases of cholera above mentioned 4 ended fatally, and it was remarked that those who suffered from the complaint in the Puzundoung quarter were all natives of India. Three other fatal cases of cholera were recorded in this town; they were all isolated cases, "and from the fact of their being so," writes the civil surgeon, "were probably not cases of Asiatic cholera at all."

In the town of Myanoung 7 deaths were registered from cholera, but no details regarding them are furnished.

In the town of Prome cholera caused 50 deaths during the year, viz., 2 in March, 9 in August, 14 in September, 3 in November, and 22 in December. Regarding the increased mortality in September and December the civil surgeon writes—

"I am inclined to attribute its sudden increase in the former month entirely to the too free indulgence by the inhabitants in edible fruits, especially the custard apple,

which was in season at the time; and in the latter to the effects of cold, resulting from exposure in attending night Poays."

He adds that, with the exception of the larger towns, in which an occasional casualty occurred in the form of choleraic diarrhœa, it may be safely stated that the district in general was comparatively free from the disease. In the jail one death from choleraic diarrhœa occurred in January.

In the town of Thyetmyo no cholera mortality is recorded in 1868.

In the town of Bassein "cholera of a most malignant type occurred." It is stated that 7 cases appeared sporadically in February, and 3 in March, all terminating fatally in a few hours; and that choleraic diarrhœa prevailed to a slight extent about the same time. Of 2 fatal cases of cholera which came under the immediate notice of the civil surgeon, he writes—

"Both, I believe, were typical cases of the form of cholera *bred* here, the most characteristic features of which are the profundity and rapid accession of the stage of collapse and the very trifling amount of vomiting and purging accompanying it."

In the Tenasserim division cholera was recorded in the following places in 1868:—In the town of Toungoo, population 9648, which is situated on the River Sittoung, "and about 160 miles from Rangoon as the crow flies, though the windings of the river route make the journey by water about 260 miles," cholera appeared in an epidemic form twice during the year 1868. The town proper is within the fort wall, and lies a little inland from the river-bank, but has several outlying suburbs, one of which lies on the bank of the river. The first epidemic occurred in May, and commenced in the town, whence it afterwards spread. The second occurred in August, and commenced in the jail, appearing afterwards in the town. The total of cholera deaths recorded during the year is 27. The origin of the outbreak in the jail could not be traced. "The disease, however, was known to be present among the wild tribes in the hills to the east," and it had already visited Mandalay, which is situated directly to the north of Toungoo.

In the town of Moulmain there was no outbreak of any epidemic disease during this year; "but, as usual, a few sporadic cases of cholera and small-pox, and a considerable number of cases of measles occurred, both in earlier and later months of the year." The total number of deaths from cholera is given at 13, but no details are recorded.

The subjoined tabular statement shows the temperature, rainfall, and prevailing winds at Moulmain during the months of 1868:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mean temperature.	Max. .	86	87	89	91	85	83	81	81	82	85	84	82
	Med. .	80	81	83	83	80	80	79	79	79	82	81	72
	Min. .	67	75	75	79	78	77	76	78	75	78	75	67
Rainfall . .		...	...	...	6·60	15·30	43·95	31·30	61·50	36·75	10·10	5·70	...
Wind . . .		N.E.			N.E. and S.W.							S.W. and N.E.	N.E.

The total rainfall was, as shown, 211.20 inches, the greatest fall being in August, viz., 61.50 inches. The rains set in rather earlier than usual, viz., about the middle of April, and occasional showers occurred at the end of the monsoon, nearly up to the middle of November.

The district around Moulmain consists for the most part of low swampy land under rice cultivation. The town itself is situated on undulating and tolerably well-elevated ground on the east bank of the estuary known as the Moulmain River. The military cantonment and a considerable portion of the upper part of the town are well raised above the river, being built partly on the slope and partly at the foot of a low range of hills, about three-quarters of a mile from and running parallel with the bank of the river. The climate of the town and district is characterised by great humidity, combined with a high temperature; but the heavy rainfall during the monsoon, while causing great humidity of the atmosphere, has the effect of lowering the temperature very considerably.

1869.—Cholera prevailed with revived epidemic activity in this year, the first of the triennial cycle 1869–71, and this was in the normal course of the periodicity of the disease.

Regarding the outbreak of cholera among the European troops at Thyetmyo in 1869, it is stated (in the Madras Sanitary Report for this year) that the epidemic took "almost precisely the same course as the 1863 epidemic. It began in a Native village near the river, and then spread to the European barracks, which were closest to the river. As regards date of appearance, the time was almost precisely the same in both instances; but there was this peculiarity in the 1869 outbreak, that, although it ceased very suddenly in May, it appeared again in August and September. Of the 12 cases amongst the British troops of the station, the whole occurred in H.M.'s 76th Regiment, and only 4 deaths resulted; but amongst the European children of the station the disease was very fatal, every child that was attacked having died. The Native troops of the station and the civil and military officers had no cholera, but the disease prevailed to some extent in the bazar in the month of September."

At Rangoon, besides the single case among the European troops, there were some cases among the bazar people. At Thyetmyo, besides the 12 cases and 4 deaths among the European soldiers, there were 5 cases and 3 deaths among the women, and 6 cases, all fatal, among the children. All these cases at Thyetmyo occurred between the 9th May and 8th September, in three separate outbreaks. Some interesting particulars are recorded concerning this outbreak of cholera at Thyetmyo, which are worth repetition here.

On the 25th April 1869, it is stated, a case of cholera was reported in the coolie lines, situated to the north, and just immediately outside cantonment limits, and inhabited chiefly by coolies employed in the Public Works Department, by regimental followers, and a few Burmans. On inquiry, it was ascertained that the disease had broken out twelve or fifteen days before, and that 12 deaths from it had occurred up to the 25th April, and 4 of the number within the last twenty-four hours, and that 2 fresh cases were at that time present. As noted by Dr. Cornish, the Sanitary Commissioner for Madras—

> "This instance affords a good example of the enormous difficulty that exists in regard to tracing out the earlier cases of cholera in a locality. At Thyetmyo there were some eight or ten commissioned and warrant medical officers on the spot who were capable of recognising the disease, but although the village lay close to the military cantonment, cholera had been prevailing for a fortnight before the fact came to the notice of the medical officers. These difficulties are much enhanced in districts remote from medical or sanitary supervision."

The coolie village was at once cleansed and placed under police sentries, to prevent soldiers from having access to the place. From the 26th April

the disease seems to have left the village, and on the 5th May appeared in the "Shye Bustie" village, on the bank of the Irrawaddy, and about 400 yards distant to the east of the coolie village, when a dooly-bearer was seized with cholera, and died from secondary fever on the 14th May. On the 7th May a store Lascar living in the store Lascar's lines, close to the Battery horse-keeper's lines, was attacked, and died the next day. On the afternoon of the 9th May the wife of a soldier of H.M.'s 76th Regiment was taken to hospital in a state of collapse, and died the following morning. She had had diarrhœa since 9 A.M. of the 9th May. On the 10th May a private soldier, from the same barrack as the preceding case, went to hospital with cholera, and was discharged convalescent on the 18th May. On the 11th May this barrack was vacated, and its inmates camped, each family in a separate tent, on an open space inside the redoubt on the bank of the river; and the same morning a child who had resided in the affected barrack, in the next room to that occupied by the preceding case, was admitted from the camp with cholera, and died the following morning. On the 11th May 5 other cases of cholera were admitted to hospital, viz., a soldier's wife from the barrack next the first affected one, and separated from it by a space of 60 yards, but in a direct line with it, who recovered; a child from the camp, who died the same night; a soldier's wife, also from the camp, who died the following evening; a sergeant's wife, also from the camp, who recovered; and a child "from a detached bungalow, on a healthy site, close to the Native Infantry lines, and a long way from the infected barrack." She died next morning. This child, up to a fortnight previous to the outbreak in the first affected barrack, had resided in that very building. Since her removal to the detached bungalow she was in the habit of attending school daily, and occasionally paid a visit to her old quarters. On the morning of the 10th May, the day after the outbreak, she breakfasted with some children (two of whom eventually died) in the affected barrack, and the following morning she returned to the building, and was present when its occupants were moving out to go into the fort under canvas. That same night she was seized with the disease, and died in a few hours. On the morning of the 12th May a child, with whom the last case had breakfasted on the 10th, was admitted from the camp in a state of collapse, and died the same afternoon. On the evening of the 12th May a soldier was admitted from the camp with well-marked symptoms of cholera. He recovered. This man's wife had been admitted the previous afternoon, and died of cholera shortly after his own admittance to hospital. On the morning of the 13th May the wife of the schoolmaster, who resided in the second affected barrack, was attacked, and died of secondary fever on the 18th May. On the evening of the 13th May a soldier (whose child died on the previous day, and on whom he had been in constant attendance) was admitted from the camp, and died the next morning. On the morning of the 14th May a soldier, who had been in constant attendance on his wife (the first case admitted from the second affected barrack) since the 11th instant, was attacked, and died the following morning.

On the 14th May the camp was moved from inside the fort to a more elevated and more easily isolated spot on the brigade parade-ground, to the west and leeward of the barracks, and distant from the nearest Artillery barrack about 560 yards. The families remained under canvas fourteen days, and enjoyed very good health.

From the 14th to the 29th May all traces of cholera disease had disappeared, when on the morning of the latter date a soldier residing in No. 12 "married

barrack," situated in a direct line with Nos. 10 (the first affected) and 11 (the next affected), to the westward, and distant from the latter 115 yards, was brought to hospital with well-marked symptoms of malignant cholera. He came to hospital the previous evening complaining of diarrhœa, got medicine, and returned to his quarters. Purging returned at 2 A.M., and at 4 A.M. he was brought to hospital. He finally recovered. No other case followed this.

On the 16th May a Native female nurse who had been employed during the day-time in attending to the wife of the schoolmaster (attacked on 13th May and died on 18th May), but at night used to return to her home in the Ordnance Lascars' lines, was attacked at 7 P.M. with diarrhœa, which continued at frequent intervals throughout the night; and early in the morning she had vomiting, then cramps and cold surface, and at 8 A.M. was taken to the Royal Artillery Hospital with genuine cholera. She ultimately recovered. This was the only instance of a native employed in attendance on cholera patients during this epidemic being attacked with the disease.

It is remarkable that in this outbreak of cholera in the 76th Regiment none but married people and children should have been attacked; and that the disease should have clung exclusively to the range of family barracks. The Artillery horse-keepers' lines, only separated from the coolie village by a ravine (at that season dry), and having constant daily communication with it, escaped without a single case of cholera. Between the coolie village and the affected barracks were situated not only the horse-keepers' lines, but also a portion of the Royal Artillery Barracks, occupied by staff-sergeants and their families, the Artillery guardroom, three blocks of single men's barracks, and the guardroom and cells of the 76th Regiment. They all escaped the disease, which, in passing from the village to the affected barrack, travelled almost due south and against the prevailing wind, which, at that season especially, blows from south and south-west. The inhabitants of the coolie village were daily employed in their several avocations about the barracks, indiscriminately throughout all the buildings, married and single; yet cholera chose a particular set, and appeared in none of the others.

The weather, especially from the 9th to the 12th May inclusive, was very hot, and every one complained of great oppressiveness. On these days the temperature ranged from 101° to 98°. On the 13th May it fell to 90°, which was the daily maximum observed in the hospital from that date to the 16th inclusive. On the 11th May 0.15 inch of rain fell, on the 14th there fell 0.60, and on the 16th the fall was 1.85 inches. This last fall cooled the air somewhat. There were no thunderstorms or duststorms of any consequence at any time during this epidemic. The prevailing winds were south and south-west, with occasional gusts from the north and east.

The last case of cholera occurred on the 29th May. Two months elapsed without a trace of the disease being observed either among the European or Native community, when on the 30th July a soldier of the 76th Regiment, a patient in hospital suffering from secondary syphilis since 21st July, was suddenly, and without any apparent reason, attacked with cholera about 11.30 A.M. He died of secondary fever on the 4th August. The next case occurred on the 1st August, in a soldier of the 76th Regiment, who was acting as a bandsman, and resided in the band bungalow to the north of and at some little distance from the barrack used as a hospital; he came to hospital on the 30th July for gumboil, was detained for the day, and ordered a purgative and local remedies; he occupied a bed in the far end of the ward in which the preceding case occurred at noon on that day. The ward was soon after evacuated by all its occupants except the man attacked with cholera;

but on the next morning he again presented himself, complaining of pain in the hepatic region, and was detained under observation. In the afternoon he complained of simple diarrhœa, but it was not till next morning that choleraic symptoms showed themselves; he recovered from cholera, but was afterwards invalided for chronic hepatitis. The third case occurred on the 4th August, also in a patient in hospital with fever since the 18th July; he recovered. On the 5th August the hospital was evacuated, and thoroughly cleansed, fumigated, and ventilated, whilst the patients were transferred to a barrack close at hand, which had been previously vacated by No. 3 company, 76th Regiment, for the purpose.

"The atmosphere at this time," it is stated, "was particularly muggy, close, and depressing; loaded with moisture, but very little rain falling; an unusual state of things at this season, which is generally marked by a heavy rainfall. Every one complained of the oppressiveness of the air, which seemed to affect most people with an undefinable idea of unhealthiness."

On the evening of the 5th August a soldier of the 76th Regiment was admitted from No. 8 company barrack into the hospital tent with cholera. He had been suffering from severe diarrhœa all day; "but although he knew that his colour-sergeant was provided with medicines, and that strict orders were issued to all men to report themselves and seek relief the moment they felt uneasy in their bowels, yet he did not do so, 'because he thought it would wear off.' He eventually recovered. How many lives, however, have been lost by this foolish and obstinate procrastination!" On the 7th August, at 9.15 A.M., a soldier of the 76th Regiment, "a patient in hospital, suffering from dyspepsia, accompanied with debility and a tendency to irregular paroxysms of ague, was seized with cholera." He died at 9 o'clock the same night in collapse.

"It was particularly observed that strong muscular contractions of the hands, with partial uplifting of each forearm, contractions of the toes, and great heat of inside of thighs continued for fully one hour after life appeared to be quite extinct."

On the previous night (6th August) a supposed death from cholera occurred in the town of Thyetmyo. "The subject was said to have arrived from Prome the same evening, and to have been ill for two or three days before his arrival." On the 8th August 3 cases of cholera and 1 death in the town were reported; on the 9th, 2 fresh cases and 1 death; on the 10th, 9 fresh cases and 8 deaths; and the disease continued in the Native town till the 5th September, up to which date 47 cases and 34 deaths had been reported. Of these, the cases and deaths were distributed as follows:—men, 12 cases, 8 deaths; women, 14 cases, 9 deaths; children, 21 cases, 17 deaths. "It is believed that many more cases occurred than those reported."

From the 7th to the 30th August a tendency to diarrhœa among the men of the regiments was observed, but not among the Royal Artillery or Native troops. On the 22d August a patient in the 76th hospital, suffering from fever, was suddenly attacked with choleraic diarrhœa, but recovered under prompt treatment. On the 30th August a third outbreak of cholera occurred in the 76th Regiment. On that date a soldier, a patient in hospital, suffering from fever, was suddenly attacked with cholera. He eventually recovered. On this day the barrack used as a hospital, and in which, two cases of cholera had occurred, was vacated to be cleaned and fumigated, and the patients were moved back to the regular hospital, which had been vacated on the 5th August for a similar purpose. The barrack, after fumigation and ventilation for three weeks, was reoccupied by its former company on the 20th September.

On the afternoon of the 2d September a fresh case of cholera occurred in the 76th Regiment. The subject was a fine healthy boy, aged 3 years and 8 months, stepson of the regimental orderly-room clerk, and resided in the staff-sergeant's quarters, "a new building, well constructed, in a good and elevated situation, raised 10 feet 6 inches from the ground, and apparently in excellent sanitary condition. It is placed at the eastern end of the regimental lines, in the direction of the river, and is 130 yards distant from No. 10 married barrack, where cholera first appeared in May." The child was suddenly attacked at 4 P.M., having been previously in good health, and died at 5 A.M. the following morning. On the forenoon of the 6th September the orderly-room clerk himself was admitted to hospital with choleraic symptoms, which next morning developed into true cholera. He eventually recovered. Early on the morning of the 8th September a child, aged 1 year and 8 months, residing with its parents in the staff-sergeant's quarters, in rooms adjoining those vacated by the orderly-room clerk, was attacked with cholera, and died the same night. On this day the staff-sergeant's quarters were vacated, and the occupants removed to tents pitched on the brigade parade-ground. "The families remained under canvas for fourteen days, and enjoyed excellent health. Meanwhile their quarters were thoroughly cleansed, fumigated, and ventilated. The building was reoccupied on 21st September," and no subsequent case occurred in it. Such is an outline of the third outbreak of cholera in the 76th Regiment in 1869.

The disease, it is stated, confined itself mainly to a fixed radius in the lines of the 76th Regiment. This fondness for localisation, observes Dr. Cornish, the Sanitary Commissioner for Madras, from whose Sanitary Report for 1879 the above particulars are taken, is often met with during epidemic visitations of cholera, and is one of the peculiarities of the disease. The localities affected by this visitation of cholera in 1869 were almost precisely the same as those which suffered in 1863, when H.M.'s third battalion 60th Rifles occupied Thyetmyo. Cholera then began in the barracks nearest the river, and was localised to the barracks of the British regiment. The Native troops and the Burmese population escaped entirely. The outbreak in 1863 began on the 27th April; in 1869 (in the coolie lines) on the 12th April; and in 1879, when the epidemic was most virulent, the first case occurred on the 7th April.

In 1869 cholera, it is stated, raged in the city of Mandalay during July and August, if not earlier; also in some villages beyond the border, between 100 and 150 miles north-west and north-east from Thyetmyo. It also existed in several villages in the Prome district, to the east of Thyetmyo, and on the opposite bank of the river, in July. The station of Thyetmyo is described as situated in a sort of amphitheatre; a range of low, wooded hills bounds it on the south, west, and north sides, and the River Irrawaddy on the east. It covers a space which is much circumscribed.

Regarding the prevalence of the cholera of 1869 among the civil population of British Burma, statistics are available, as in the two preceding years, only for the principal towns of the province. The deaths registered in these towns during 1869 show an enormously increased mortality from cholera, indicating a very severely active epidemic prevalence of the disease. The returns also show a very marked difference in the local distribution of the cholera of 1869 in this province as compared with that of the two preceding years. In 1867 cholera in this province was almost wholly confined to the Pegu division, both the other divisions remaining more or less completely exempt. In 1868 the disease was prevalent in both the Pegu and Tenasserim

divisions, in the latter confined chiefly to its northern districts, whilst the Arakan division still continued more or less entirely free from it. But in 1869 cholera was violently epidemic in the Tenasserim and Arakan divisions, whilst the Pegu division escaped with a comparatively mild visitation. In other words, the cholera of 1869 prevailed epidemically in the southern and northern divisions of the province, but left the central division more or less comparatively unaffected.

In the Tenasserim division cholera appeared in the town of Mergui, population 10,000, in the latter end of February. The first case occurred on the 26th of that month, in the south end of the town, which is its lowest-situated and dirtiest part. There were 6 deaths from the disease recorded in February, and 24 in March; and altogether 181 during the year, the last in September. About the same time that cholera appeared in Mergui town the disease also broke out in the village of Palaw, on the river of that name, and about 40 miles north from the town of Mergui; up to the end of March there were altogether 26 deaths from cholera in this village; also in the villages of Kahan, to the east of the town, and Engapore, 30 miles to the north of the town. The rainfall of the year in Mergui was 165 inches. In May the fall was 13 inches against 36 in the same month of 1868. The fall from January to May was 21.30 inches, from June to September 130.20 inches, and from October to December 13.50 inches. This outbreak of cholera in the Mergui district was, it is stated, a continuation of the same disease in a southerly direction from Thoyne. The disease spread down the hills to the east among the Karen tribes. Thoyne is a village of about 100 houses, situated on the left bank of the Salwin River, about 25 miles north of Moulmain, and 6 to the south of another village, Hpagat, in which cholera had also appeared. On the 5th December 1868, when visited by the Sanitary Commissioner, cholera was active in Thoyne; several persons had been attacked, of whom 3 died. On the following day the Sanitary Commissioner visited Hpagat, and found the village free of the disease, although, as reported, cholera had carried off 17 persons in the town. From Hpagat, in the direction of Menzai, the Sanitary Commissioner called at each village on the banks of the river, but found no word of cholera in that direction; and on his return journey to Moulmain he found no cholera to the south of Thoyne.

The mortality from the cholera of 1869 in the Tenasserim division is not accurately known, owing to the incompleteness of the returns. In many instances, it is stated, it was found impossible to obtain any reliable information after the fact, as the hill Karens, directly cholera showed itself in their villages, vacated them, and afterwards burnt them down, removing themselves to new clearings. The total deaths reported from cholera in this division are thus distributed, viz.:—Hpagat, 12; Thoyne, 30; Kadoe, 1; Moulmain, 29; Amherst, 1; Yea, 62; Tavoy, 5; Mergui town, 181; Mergui district, 225; other towns in the division, 86; total deaths, 662. This number, it is supposed, is probably much under the actual mortality caused by the epidemic in this division.

In the Arakan division, the first case of cholera in the town of Akyab was noted on the 1st January 1869, although a fatal case is said to have occurred in the preceding month. Regarding the cholera deaths in Akyab, it is recorded that 3 others occurred during January; that during the first three weeks of February there were only 2, but on the 22d there were 3; and from that date to the 30th April daily deaths from the disease were reported. The largest number in any one day, 19, occurred on the 29th

March. After this the disease gradually decreased in severity, and had almost disappeared on the 15th May. Up to this date 519 deaths from cholera had been registered by the Magistrate, who, it is stated, believed that a much larger number than this really died, and estimated that number at about 700, or at the rate of 3.8 per cent. of the total population. Cholera was prevalent in the villages of this district early in January, and in some of them in December 1868, viz., in the villages near the eastern outlets of the Nga Kiendah and Ally Kyoung Passes through the Myo Hills towards Chittagong. It appears that cholera was active during the latter part of 1868 and early in 1869 in the Pegu division also. A few cases, it is stated, were noticed in Prome in November and December 1868 and January 1869; in the village of Tsanyuay, in the southern part of the valley of the Irrawaddy, whence it was traced to the Yomah Hills, which separate this valley from that of the Sittoung; in the valley of the Hlyne River; and in December 1868 in Nyoungdoon and Rangoon.

In reference to the outbreak of cholera in Akyab, the Sanitary Commissioner writes—

"I do not believe that the disease was imported from Chittagong; because, had it been so introduced, we should have heard of cases occurring on board the little steamer *Moulmain*, which regularly plies between these two seaport towns, carrying multitudes of coolies; yet not a single individual was attacked while proceeding in her. The explanation of the greater liability of the Chittagong coolies in Arakan to the disease than the natives of the country is to be found in the great privations, fatigues, and exposure they undergo in a foreign climate. It is remarked that the Mughs were not attacked for some time; they seemed at first to be proof against the disease, but afterwards fell victims to it; and when it was once among them, they died as rapidly as the natives of India. But then they, being residents of the place and generally well to do, were not exposed to the hardships undergone by the Indian coolies come in search of labour and food."

By some the spread of the disease in Akyab was attributed to the use for drinking purposes of the foul water of the Cherrogeah Creek, since the epidemic was most severe among the labouring people residing in the low-lying and overcrowded part of the town situated about the banks of that stream, into which, it was asserted, the bodies of those who died from cholera had in many instances been thrown. But admitting that this was the case, it is stated—

"That the current in the harbour runs very strongly, and very few bodies which once get into it would be thrown upon the bank."

It is recorded that in Akyab—

"Cholera ceased after heavy rain on or about the end of May, but on the weather again becoming fine the disease reappeared."

As has been stated in the history of the previous year's cholera, a severe cyclone swept over the town of Akyab on the 13th November 1868, and extended inland in a north-easterly direction. Following this the meteorological phenomena of Akyab are most imperfectly known. The average temperature is given as follows:—January and February, 64°; March and April, 83°; May and June, 82°; July and August, 82°; September and October, 80°; and November and December, 70°. The total rainfall of the year is shown at 183.70 inches, distributed by months as follows:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Rainfall .	...	0·05	...	2·00	4·70	51·10	55·40	37·30	27·05	5·40	...	...

The Magistrate of Akyab, in his cholera report, says—

"It is a fact worthy of note that out of a population of 160 Chinamen not one man has died in the town (two, however, have died in the jail). The disease was raging on all sides of their quarter; besides, many Chinamen were daily employed as carpenters at the Cherrogeah Creek, where cholera was at one time worst. Their habit of life was not altered during the epidemic, so this freedom from its attack may be considered very remarkable."

The Sanitary Commissioner investigated this statement on the spot, and found it to be perfectly true. The Chinamen said, he writes—

"We escape the disease because we always drink tea, and not cold water."

Regarding the prevalence of cholera in the Akyab district, the following deaths from cholera were registered from January to October inclusive, 1869, in each of the eight townships into which the district is divided. The returns show that the disease was very generally diffused over the whole district, and prevailed with considerable virulence.

1. In the Naaf township, composed of 11 circles, 8 circles were affected. Altogether 641 persons were attacked, viz., 354 males and 287 females. Of these, 227 died, viz., 129 males and 98 females, the percentage of deaths to attacks being 35.41, and to population (35,853) 0.63. Of the deaths, 210 were reported from the beginning of January to the middle of May, 11 from the middle of May to the 17th June, and 6 from this latter date to the close of October.

2. In the Rathaidoung township, composed of 21 circles, the whole number was affected with cholera. The seizures were altogether 4180, viz., 2343 males and 1837 females; the deaths were 2716, viz., 1549 males and 1167 females, the percentage of deaths to seizures being 64.97, and to population (51,265) 5.20. Of the deaths, 643 were reported from 1st January to 15th May, 17 from that date to 17th June, and 2056 from this latter date to the close of October.

3. In the Ooreetoung East township, composed of 17 circles, all were affected. The number of seizures reported was 1711, viz., 891 males and 820 females; the deaths were 1192, viz., 588 males and 604 females, the percentage of deaths to seizures being 69.66, and to population (22,414) 5.31. Of the deaths, 72 were reported from January to middle of May, 7 from middle of May to 17th June, and 1113 from this latter date to the close of October.

4. In the Ooreetoung West township, composed of 19 circles, 18 were affected. Altogether, 4111 seizures were reported, viz., 2163 males and 1948 females. The deaths were 2492, viz., 1330 males and 1162 females, the percentage of deaths to seizures being 60.61, and to population (34,936) 7.13. Of the deaths, 539 were reported from January to the middle of May, 12 from middle of May to 17th June, and 1941 from this latter date to the close of October.

5. In the Myohoung township, composed of 21 circles, 20 were affected. The total of seizures reported was 2023, viz., 1067 males and 956 females; the deaths were 1453, viz., 758 males and 695 females, the percentage of deaths to seizures being 71.82, and to population (38,915) 3.70. Of the deaths, 177 were reported from January to the middle of May, 8 from this date to 17th June, and 1268 from this latter date to the close of October.

6. In the Kolladan township, composed of 8 circles, 6 were affected. Altogether, 135 seizures were reported, viz., 85 males and 50 females; the deaths

were 89, viz., 51 males and 38 females, the percentage of deaths to seizures being 65.90, and to population (15,896) 0.56. Of the deaths, 25 occurred from January to the middle of May, and 64 from that date to the end of October.

7. In the Mengbra township, composed of 19 circles, 17 were affected. Altogether, 1366 seizures were reported, viz., 669 males and 697 females; the deaths were 1111, viz., 537 males and 574 females, the percentage of deaths to seizures being 81.30, and to population (35,856) 3.06. Of the deaths, 154 were reported from January to the middle of May, 9 from this date to 17th June, and 948 from this latter date to the end of October.

8. In the Kyailet township, composed of 13 circles, 10 were affected. Total seizures, 583, viz., 325 males and 258 females; the deaths were 417, viz., 226 males and 191 females, the percentage of deaths to seizures being 71.52, and to population (21,071) 2.48. Of the deaths, 213 were reported from January to the middle of May, and 204 from that date to the end of October.

The cholera of 1869, it is thus shown, appeared simultaneously in all the townships of the Akyab district during the month of January. In Akyab itself and the townships of Naaf the epidemic more or less completely subsided by the end of May; but in all the other townships of the district, after a check from the middle of May to the middle of June, the disease started into fresh activity, and prevailed with greater epidemic force during July and August, and finally ceased by the end of October.

In the Kyoukphyou district cholera is reported to have appeared in the month of March, and to have ceased in the month of August. Altogether 1241 deaths from the disease were reported, the chief mortality having occurred in the island of Cheduba. No details of the course and progress of the disease are recorded.

In the Sandoway district cholera, it is stated, appeared in August, the first case observed having occurred on the 6th of that month, and it seemed to have entirely ceased on the 9th of September. During this period there were in all 45 cases and 23 deaths. During the heavy rains the disease remained in abeyance, and in October it broke out afresh near the hills in the northern township, and close to Toungoo, which escaped; altogether 94 seizures and 65 deaths were reported here. The district was not entirely freed of the disease till the end of November. The town of Sandoway itself entirely escaped the disease. It is stated that "the total amount of rainfall in the town of Sandoway for the year was 195.35 inches, being 61.80 inches less than that recorded in the previous year."

Regarding the cholera of 1869 in the Pegu division, the following particulars are recorded:—

In Bassein the disease appeared on the 1st July on the opposite side of the river to the Thenkangin quarter. From this date up to about the 1st August the disease abated during heavy rains, but again showed itself on the 17th of the month, when three cases were registered. After this it died out altogether. The cases were all sporadic in character. The weather is described as "exceptional, sultry, with little or no rain," and the town as "filthy in many parts." The total rainfall during the year was 89.14 inches; the greatest fall occurred in June.

In the town of Myanoung "cholera of a sporadic epidemic form made its appearance on the 10th December." One of the first cases was an emigrant from Upper Burma. The last case reported in the town occurred on the 30th December. The disease was subsequently reported to have made its

appearance at Kanoung, a station a few miles to the south and on the same bank of the river; at Mengyee, on the opposite bank; and lastly at Dunabew. A few cases were also observed at Henzada (4 deaths) and Zaloon (5 deaths), at Nyoungdoon (15 deaths), and at Thanjoung (15 deaths).

In Prome, both in the town and district, cholera appeared twice in the year—first in the early months, and again in December. During this year the swamp-ditch round the town had been nearly filled in. The meteorology is thus described—"The year 1869 was one of great heat and scanty rainfall. . . . At Prome the thermometer in March and April rose to 103° F. At Prome the total rainfall during the year was 34 inches, and Thyetmyo 33 inches, against 48 inches at both places in 1868." The usual Prome fair did not take place this year, owing to the prevalence of epidemic smallpox. The total of cholera deaths at Prome is given at 114. The rainfall of 1869, compared with that of the three preceding years, is shown as follows in inches and cents., together with the temperature in 1869:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
1866	...	...	...	...	2·71	14·27	7·18	7·45	12·69	18·50	3·80	0·80	Rainfall.
1867	...	...	0·21	0·21	8·49	6·57	3·94	5·80	4·73	4·10	1·56	0·67	
1868	...	...	0·80	1·50	4·90	7·61	14·60	8·49	5·33	3·59	1·67	...	
1869	...	0·60	...	0·50	3·37	7·87	5·90	3·05	6·75	5·35	0·60	...	
Max.	90	95	103	103	102	97	90	90	88	88	90	98	Thermometer.
Min.	56	57	62	74	77	77	76	71	74	70	70	60	

In Thyetmyo cholera appeared in the month of April in the coolie lines, and in that of May among the European troops, and also among the natives in the town, and continued off and on up to the month of September. It is stated that very little rain fell throughout this period, and the weather remained in consequence oppressively hot. The coolie lines, in which the disease first appeared, are situated to the north of the cantonment, a goodly-sized nullah intervening, and are described as extremely dirty and filled with refuse, cow-dung, &c., &c. "The soil is gravelly and conglomeratic, covered as well as interspersed with fossil-wood in abundance." From about the middle of April to the 25th of the month, after which no other cases of cholera occurred there, altogether 8 deaths from the disease were traced in the coolie lines. The first case observed in the cantonment occurred on the 5th May, and was that of a commissariat dooly-bearer employed in the Government bakery, and living in a village opposite the coolie lines. The first case among the European troops occurred on the 9th May, and was that of a woman of H.M.'s 76th Regiment. From that date to the 25th May there were 12 cases of cholera and 8 deaths, and 1 from "choleraic diarrhœa." The Artillery barracks, which lie between the coolie lines and H.M.'s 76th Regiment lines, escaped the disease. The outbreak ceased on the 29th May. The town of Thyetmyo and the 36th Regiment Madras Native Infantry remained free from the disease. During all June no cholera was reported; but in July the disease reappeared in H.M.'s 76th Regiment, and also appeared in the Native town. The particulars of the first cases

were overlooked; the disease finally ceased on the 8th September. "The direction of the wind during the outbreak was S. and S.E., with occasional gusts from the north and east." The weather is described as "oppressively hot, producing feelings of great lassitude." The water-supply is said to have been "abundant, good, and wholly procured from wells." The weather, it is said—

"Was most unusual, and favourable to the propagation of the disease. Little or no rain fell throughout the monsoon until the month of September, when the disease died out." It is added that "it has been noticed for several years that cholera is very apt to break out near the bank of the river at Thyetmyo, among the European troops stationed there, in the very hot weather."

Rangoon escaped the cholera of 1869 altogether. There were a few cases in Dalla and Duneedan in December 1868, but the disease did not spread.

1870.—In this year there was a general abatement of cholera from the severe epidemic prevalence of the preceding year, although the incidence of the disease among the European troops was altogether exceptionally severe, and among the jail populations also.

Among the civil population the death-rate from cholera was 0.96 per mille of population in 1870 against 4.01 in 1869. This abated prevalence of the disease in 1870 was in the normal course for that year, as the second of the triennial cycle 1869–71. The cholera of 1870 in the British Burma Province was mainly confined to the Pegu division, which returned 2003 out of the total 2383 deaths registered among the civil population during the year. There was also considerable prevalence of the disease in the Arakan division, which returned 378 deaths. But the Tenasserim division, with the exception of two isolated cases reported in Tavoy town, enjoyed a complete immunity from the cholera of this year.

In the Arakan division, the first case observed in the town of Akyab occurred in the jail on the 1st June, and there were altogether 32 deaths in fourteen days. "The outbreak ceased suddenly and completely on the occurrence of heavy rain on the 14th June." There were 27 cholera deaths reported in the town during the year. In July 2 cases of cholera were reported in the Kyailet township, and 1 death from the disease in the Myohoung township. In November 1 death was reported in the Mengbra township, and in December 1 in the Naaf township, all in the Akyab district, which suffered so severely in the preceding year.

In the Kyoukphyou district cholera appeared on the 3d June at Aeng, in the Ramree township, and caused 34 deaths before it disappeared. On the 14th July the disease appeared at Kyoukphyou, and on the 18th July at Ramree. It caused 7 deaths in the former and 75 in the latter in the course of eleven days, when it completely died out.

In the Sandoway district cholera appeared at Tanklway on the 25th June, and in Sandoway town, farther south, in August, and lingered in the district until the end of October.

In the Bassein district (Pegu division), adjoining that of Sandoway, the disease appeared at the close of August.

In the Pegu division cholera appeared as early as January, and prevailed in the districts of Thyetmyo, Prome, and Myanoung until August. The first case of cholera in the Pegu division was reported on the 2d January, in the township of Tsanguay, in the Myanoung district. The disease continued here until the 7th April, and 26 deaths were reported. There was no other report of cholera in this district of over 4000 square miles area "until the

middle of July, when it broke out in the same locality, and spread with such amazing rapidity as to have invaded almost every township before the close of the month. In some of these it remained only a few days, in some a month, and in some—Kanoung, Mengyee, Henzada, and Zaloon—as long as six months; but the total mortality suffered by the people was small; it amounted to altogether 438, which gives a death-rate for the district of but 1.03 per mille of population. . . . The rapidity with which cholera spread through sixteen townships of this extensive district was so great as to have rendered its appearance almost simultaneous in many of them far removed from each other, and to have precluded altogether the possibility of tracing its course."

In the Thyetmyo district cholera appeared on the 6th February, in the village of Rwatoung, and continued till the 1st June, when it finally disappeared. During this period of nearly four months 21 deaths were recorded from the disease. The next place from which cholera was reported was the coolie lines in the Thyetmyo cantonments, where a man died from the disease on the 4th April. "From this point the disease spread through twenty-six villages and townships with great rapidity, and did not finally die out until the middle of November. In ten of these it caused only 1 death for each; in five 2, in four 4; and with the exception of the cantonments, where there occurred 38 deaths in two months, 22 was the greatest number of casualties that happened in any one place." The total mortality registered from cholera in this district was 209 in seven months, giving a death-rate of 1.60 per mille of population.

In the Prome district cholera prevailed in the Poungday township, "in the most violent form in which it was seen during the year." In the beginning of the year it caused 32 deaths in the town of Prome and 5 in the lock-up during April and May, when it entirely disappeared from the neighbourhood. From March to June inclusive the disease prevailed in Poungday, and the deaths from it were reported as 1002; it appeared also in the townships of Shwedoung, Padoung, Shewlay, and Mahathaman, and caused in them a total of 139 deaths.

Regarding the cholera of 1870 in the town of Akyab, it is stated that 22 cases occurred from May to October, and that 17 of them ended fatally. Regarding the outbreak in the Akyab jail, it is stated that the first case was admitted into hospital on the 1st June, and the last on the 14th June; in these fourteen days there were 53 admissions and 32 deaths. Among the first cases were those of three European sailors, of whom one died on the 8th June; the first death was on the 1st June, the last on the 12th. The total rainfall of June was 31.80 inches, of which quantity only 6.40 inches had fallen up to the 14th June; "the heavy rain was delayed till midnight of the 14th."

During the fourteen days the cholera raged in the jail the atmosphere was "close and muggy," and "the heat of the season was driven up to the highest point of utterly relaxing sultriness, when on the night of the 14th the heavy downpour really burst, and continued steadily on throughout the month." Comparing the meteorology of the period with that of the same period in the preceding year, it is stated that the mean temperature for May was 83° F., and for June 82°; while that of both months in 1869 was also 82°. In May the rainfall was very nearly 16 inches, that of May 1869 having been under 5 inches; in June and July the falls were respectively 31.80 and 45.00 inches against 51.10 and 50.40 inches respectively in the same months of 1869. In both years the wind blew in the same direction.

Regarding the prevalence of the cholera of 1870 in the principal towns, the following records appear:—

In Kyoukphyou cholera appeared on the 14th June, and there were 7 deaths. The disease, it is stated, appeared in a very mild form, and seems to have completely died out in a few days. The rainfall of the year is given as 156.60 inches against 145.20, the average of the preceding five years.

In Sandoway cholera prevailed from June till the end of October, and caused altogether 19 deaths. The rains, it is stated, set in somewhat earlier than usual, and there was more than ordinarily frequent thunder and lightning. The rainfall was 217.90 inches, being 22 inches in excess of that of the preceding year.

In Rangoon cholera appeared in July, and caused 20 deaths, all in that month, the first on the 12th, the last on the 26th. "It attacked only persons of weak habit, or those debilitated by the use of opium or intoxicating drinks," and "was entirely sporadic in its character." The monsoon, it is stated, set in as early as the 28th April, accompanied by strong winds; and it continued to rain till the 28th of the following month without intermission, when the prevalence of intermittent fever became very marked. In the subsequent four months very little rain fell, and the total rainfall appears to have been the smallest almost ever known, being slightly over 80 inches.

In Bassein cholera appeared in the beginning of the year, but was sporadic in its character. "The disease was chiefly confined to the suburbs, where the soil is very alluvial and of a marshy description." The total number of deaths from April to August, when it finally disappeared, was 60. The rainfall, it is stated, was less than the average, and the mean temperature proportionally greater.

In Henzada cholera appeared on the 28th June, "when every part of the town had undergone its annual cleansing by monsoon rains." The outbreak was confined to one locality, and lasted only six days, and then ceased entirely. It caused 7 deaths. The first case, it is stated, occurred in a native of Upper Burma, who was taken ill in his boat, and removed to a friend's house in the town.

In Prome "the year 1870 proved no exception to the fourteen which went before it as regards cholera; but, it is stated, the usual appearance of the malady in the cold weather was very slight. It was a continuation of an outbreak in 1869, and caused 32 deaths. The disease appeared again in April among the inmates of the jail, of whom 5 died; and it also attacked a party who had arrived in the station from the Sanitarium of Mountjoy, to one of whom, a native of India, it proved fatal. While the town of Prome was thus comparatively mildly affected, "the surrounding district suffered severely, over 1900 of its inhabitants having died in the course of six months."

Regarding the weather, it is stated that the meteorological conditions of the year did not present anything unusual.

The fall of rain, which commenced and ended at its normal periods, closely corresponded with the average of the preceding five years, being a little more than 46 inches, while the range of the temperature and atmospheric pressure showed little difference from what was observed in other years. The thermometer indicated a maximum of 103° F. in the shade during the months of March and April, and fell as low as 52° at the close of January.

In Thyetmyo the cholera of 1870 appeared in the coolie lines on the 4th April, and ceased on the 16th, causing 2 deaths; in the cantonment the disease appeared on the 7th April, and ceased on the 29th May, causing 38 deaths; in the town it appeared on the 18th April, and lingered on until the

10th November, causing 22 deaths. The prevalence of the disease in the district has been already noted. Regarding the weather, it is recorded—

"No meteorological phenomena were observed in any way of an unusual kind. The mean temperature was much the same as in previous years, and the amount of rain, viz., 40.59 inches, which fell in the course of the year did not differ from the normal average."

In Toungoo there appears to have been no cholera in 1870. The climate of Toungoo, it is stated, "differs from that of all other of our stations in the province. Though in about the same latitude as Thyetmyo, the atmosphere is much more humid, and the range of its temperature much greater. While the rainfall at Thyetmyo averages less than 40 inches, that of Toungoo is nearly 100, or not very different from Rangoon. No doubt this is due to the proximity of high mountain-ranges. Again, the thermometer rises in the month of May to 107°, while at Thyetmyo it rarely reached 103°; and it has been known to fall to 47° just before sunrise in December or January—the mean annual temperature being about 80°." During 1870, however, "the rainfall was scarcely more than two-thirds of its usual amount."

In Moulmain "cholera and choleraic affections were completely absent" in 1870. Regarding the weather, it is stated that "the only meteorological phenomenon that was observed was the wonderful decrease in the fall of rain that took place. The quantity registered was as much as 26.50 inches less than the average of the preceding ten years. The seasons, however, were regular in their approach, and sudden oscillations of temperature, or changes from dry to humid or humid to dry, were exceptionally rare.

In Shwegyin there was no cholera recorded in 1870. It is stated that nothing worthy of attention occurred to distinguish the climatic conditions of the year from those which have gone before, and the rainfall differed only by seven-tenths of an inch from that of 1869.

In Tavoy two cases of cholera were reported, but no information was obtained as to the circumstances under which they occurred. It is stated that nothing remarkable in the climatic conditions of the year was recorded. The mean temperature was not different from that of ordinary years, and the rainfall closely corresponded to its average.

In Mergui no cholera was recorded in 1870. It is stated that no difference, in comparison with ordinary years, was observed in the climatic conditions of 1870, except that the rainfall was less by 18 inches than that of 1869.

Regarding the outbreak of cholera at Thyetmyo, it is stated (Madras Sanitary Report for 1870) that the disease began first amongst Native followers on the 4th, and then in the barracks of H.M.'s 76th Regiment on the 7th April. "The affected companies were sent out to the cholera encampment; but a second outbreak occurred in this encampment, necessitating a further move across the river, when the disease stayed, and on the 2d May the survivors were brought back to cantonment." On the 19th May cholera broke out in the Native town, and in the jail on the 28th, and again among the European troops about the end of May. In all, 47 Europeans were attacked with cholera, and 35 of them died. Of the number attacked 38 were troops, and the remainder mostly the families of the 76th Regiment and Artillery. The cholera cases reported among Natives in the town were 34, with 28 deaths. The disease prevailed in and about Thyetmyo until 10th November, when it disappeared.

Regarding this outbreak of cholera in 1870 in H.M.'s 76th Regiment, which suffered so severely in the preceding year at the same place and about

the same time, and the Royal Artillery, the following particulars, among others, are recorded. The outbreak began on the night of the 3d April, when 2 cases occurred among the Native followers of the regiment, 1 in the coolie lines, the other in the Sadar bazar. The disease appeared among the European troops on the 7th April, on which day 7 cases occurred among the men of the 76th Regiment and in a Royal Artillery barrack. The affected barracks were vacated successively on the 8th and 11th April, and their occupants moved into camp on the brigade parade-ground. On the 8th April a second patient in hospital in Thyetmyo was attacked with cholera, and shortly afterwards the wife of the hospital sergeant, who resided in the building. During the night of the 8th April the wife of a corporal residing in No. 10 married barracks was attacked; also two soldiers in G. and L. companies respectively. On the morning of the 9th another man of the L. company was seized, and in the afternoon one of the G. company. The next case occurred on the afternoon of the 12th, when a man of E. company was attacked. On the 13th the first case occurred among the men moved out to the cholera camp, and from that date to the 19th April 14 fresh cases occurred, of which 12 died. These cases occurred principally in the L. company; and on the 15th April 7 fresh cases, of which only 1 survived, occurred in this particular company. Between the 16th and 20th April B., G., and L. companies and the band and drummers were moved to fresh ground on an elevated site on the opposite bank of the river. Here a man of the G. company (which had crossed the river the day before) was seized on the 20th, and died very rapidly. Several cases of "diarrhœa" were reported also in all the companies. During these days there was no cholera in the barracks, but there was a good deal of diarrhœa and much debility, especially amongst the women and children. The battery of Artillery had only a single case of cholera, on the 7th April, but some cases occurred among the natives in the cantonment.

On the night of the 20th April two children were attacked in No. 12 family barracks in Thyetmyo, and no other case occurred in the cantonment on this occasion. On the 21st April the Roman Catholic chaplain, who had been indefatigable in his attendance on the sick in the hospital camp, was seized with cholera, and died on the 23d. This was the last case connected with the camp. On the 2d May the men returned to their barracks. About the end of May, after the return of the affected troops to cantonments, there was another outbreak, which was confined chiefly to the Royal Artillery.

The presence of choleraic influences in the station, it is stated, exercised a very deteriorating effect upon the general health of the 76th Regiment, and the men suffered greatly from the depressing influences that surrounded them. They suffered from "extreme debility, with pains in the back and limbs; a small, weak, quick pulse; a white flabby tongue, marked distaste for food, and in some instances slight diarrhœa, with a general feeling of malaise; there is tendency to syncope and giddiness, the countenance is anxious, the eyes hollow and dark round their orbits, and the face suffused with pallor, and a general expression denoting debility." On the other hand, it is stated, the men of the Royal Artillery were in excellent health. Yet they had 9 cases and 6 deaths from cholera, out of a strength of 128, against 29 cases and 21 deaths in the 76th Regiment, with a strength of 298. The station of Thyetmyo lies in a hollow, and the lines of the British troops are in the bottom of the basin, whilst those of the Native Infantry are on a plateau along the edge of the basin.

The weather at the time of this outbreak is described as intensely hot

and unusually dry; and no rain fell till the 28th April, when the intensity of the disease had subsided. In the Native Burmese town cholera broke out on the 19th April, but it did not appear in the jail until the 28th May, and again among the European troops about the end of May. Among Europeans there were altogether 47 cases and 35 deaths, including those in the families of the 76th Regiment and Royal Artillery. In the Native town 34 cases, with 20 deaths, were reported. In the Native Regiment (Madras Infantry) stationed at Thyetmyo, strength 643, there was only a single admission into hospital and no death from cholera.

1871.—In this year cholera subsided into comparatively entire abeyance in British Burma. Among the civil population only 162 deaths from cholera were registered in 1871 against 2383 in 1870 and 11,864 in 1869, or at the rate per mille of population of 0.07, 0.96, and 4.01 respectively. In regard to territorial distribution, the cholera of 1869 prevailed most severely in the Arakan division, less so in that of Tenasserim, and least so in the Pegu division; but the whole province was more or less generally affected. The cholera of 1870 prevailed with most severity in the Pegu division, and with less severity in that of Arakan, whilst the Tenasserim division enjoyed a marked immunity. The cholera of 1871, on the other hand, which was a minimum cholera in the three-year cycle, mainly appeared in the Pegu division, only 30 out of the total 162 deaths registered having occurred in the Tenasserim division, whilst the Arakan division remained absolutely exempt throughout the year.

The registration of deaths among the general civil population was introduced in this province in July 1870; the year under review, therefore, is the first for which we have the statistics for the whole twelve months. The death returns, as they stand in the monthly statements for the several districts, show that the cholera of 1871 in this province prevailed epidemically only in the Bassein and Henzada districts of the Pegu division, and during only the first three months of the year. In these districts the disease appears to have been the lingering relics of the epidemic cholera prevalent in them at the close of the preceding year; as also was the case, in a lesser degree, in the Thyetmyo district. In the Toungoo district of the Tenasserim division 18 deaths from cholera were registered in March, and 1 each in May and June, but no particulars are recorded concerning them. After March the cholera of the year appears to have ceased activity, only isolated deaths appearing in the returns for the subsequent months.

The rainfall of the year 1871 for the province as a whole was exceptionally heavy, being more than 29 inches in excess of that of the preceding year, and 26¾ inches in excess of the average annual fall. It is to be noted that this excessive fall did not come after a season of any marked drought, the rainfall of 1870 having been hardly 2½ inches below the average, whilst that of 1869 was about as much above it.

1872.—In this year, the first of the triennial cycle 1872–74, cholera prevailed with a fresh revival of epidemic activity. The incidence of cholera in 1872 among the troops and jails is shown in abstract in the tabular statements Nos. III. and IV. Among the civil population the renewed activity of cholera in this year is marked by a rise in the death-rate to 0.24 per mille of population against 0.07 in the preceding year. The revived activity of cholera in 1872 was coincident with a very marked defect in the rainfall, which was 33½ inches less than the fall registered in the preceding year, and nearly 7 inches less than the average (see Table No. V.)

The total number of cholera deaths registered among the civil population

in 1872 amounted to 640 against 162 in the preceding year; and no less than 524 of the number occurred in the district and town of Akyab. In the Akyab district cholera was active in the Naaf township, in the extreme north of the district, as early as January, during which month 8 deaths from the disease were registered there. In February the disease appeared in the town of Akyab, 1 death from it being registered on the 14th and another on the 15th of that month. No other cholera deaths were reported during this month throughout the district. On the 5th March the disease was again reported in Akyab town—

"Among the Chittagong coolies, who flock to Akyab during the rice season, and are crowded in filthy huts on either bank of the Ngayogya Creek; 98 deaths from cholera were registered among them up to the end of March, and 45 in April; it ceased towards the end of April."

In the Akyab jail cholera appeared on the 27th March, and from that date occurred daily until the 17th April, when the disease ceased altogether; the total seizures were 71, and deaths 19. "The first prisoner attacked was a man under sentence of death, confined in the solitary cells, who had very little communication with any one for some time." It is noted as—

"Strange that nearly all the mortality in the town was amongst the Chittagong coolies, whilst in the jail it was amongst Arakanese, not one native of India or Chittagong having been attacked, although several were in the jail." It is said that the disease would have caused much greater mortality amongst the Chittagong coolies than it did had they not fled in great numbers from Akyab to their own country when they saw that it had become epidemic amongst them.

During this outbreak great difficulty was experienced in getting them to bury their dead; several bodies were found in the creek, and over twenty bodies were discovered unburied in the Chittagong burial-ground on the 2d April. Regarding the jail, it is stated—"The situation of the jail at Akyab is what would appear to be the healthiest part of the place, but whenever cholera appears in Akyab it invariably attacks the prisoners. The buildings of the jail have been condemned; they are confined, and enclosed by a high wall which comes close to the buildings, so that there is no circulation of air in them, and the sun never shines on the greater part of the jail; the consequence is that the ground is always damp." After the first outbreak in the jail, which ceased on the 21st April, there was no other case of cholera until the 26th July, when 1 case occurred, which recovered. Then there was no fresh case till the 1st August, when 4 prisoners were seized, viz., 2 European sailors, of whom 1 died, and 2 Arakanese, of whom also 1 died. Two other cases occurred, and the disease ceased on the 4th August; total seizures 7, and deaths 3. Similarly, in the town of Akyab the outbreak of the 14th February is said to have ceased on the 28th April, after which no case was reported till the 9th July, when the disease reappeared, but continued for a short time only, and again ceased on the 29th July. In the district generally cholera ceased activity by the end of August. In the opinion of Dr. Mountjoy, the civil surgeon of Akyab, cholera is simply a form of ague.

Besides the cholera recorded in Akyab district, the following other districts recorded the disease in 1872, viz., Kyoukphyou, 11 deaths during the year; Sandoway, 25; Rangoon, 39; Bassein, 8; Henzada, 15; Thyetmyo, 13; and Moulmain, 5; but no particulars are recorded regarding the appearance and course of the disease in these districts.

The rainfall of the year, as already stated, was greatly less than that of

1871, and also somewhat below the average. The only places in which the rainfall of 1872 was in excess of that of 1871 were Akyab and Thyetmyo.

Regarding food-supply, it is stated—"The various articles composing the food of the inhabitants were cheap and plentiful in 1872, with the exception of sesamum oil, which was dear during the latter part of the year."

1873.—The newly revived epidemic cholera of 1872, instead of abating, acquired greatly increased force in this year, both among the troops, European and Native, and the jail populations, and among the civil population. Among the civil population the death-rate from cholera was 2.99 per mille of population in 1873 against 0.24 in 1872. Regarding death registration among the civil population in 1873, it is stated—"The returns are still far from correct. . . . But, on the whole, it may safely be assumed that there was an improvement in registration" as compared with the preceding year. "In a country in the condition of British Burma at the present time, where there are little hamlets scattered about all over the country, out of sight, and for the greater part of the year out of communication with the rest of the world, an elaborate and accurate system of vital statistics is altogether out of the question." The figures, however, as they stand, show a very greatly increased prevalence of cholera in 1873, and in this they are confirmed by the accurate returns for the troops and jails.

This increased prevalence of cholera in 1873 was coincident with a rainfall of more than 3 inches in excess of that of the preceding year, though it was still about $3\frac{1}{2}$ inches below the average; that is to say, it was a comparatively heavy rainfall following upon a season of drought, which, in comparison with the heavy rainfall of 1871 (see Table No. V.), was a season of severe drought. This circumstance is worthy of attention as a factor in the production of the increased cholera activity of 1873, because the same sequences, in the relation of cause and effect, have been observed to obtain in other parts of India.

The death returns among the civil population for 1873 show that the cholera of the year was almost wholly confined to the Pegu and Tenasserim divisions, the Arakan division, in which the cholera of the preceding year was mostly prevalent, having in this year enjoyed a marked immunity. The disease, which appears to have been more or less persistently present in the Rangoon district of the Pegu division throughout the preceding year, although in very weak force, in this year burst into activity in January, and prevailed with more or less steady epidemic intensity to the close of the year, when it was still in considerable activity. More than one-fourth of the entire registered cholera mortality in this year occurred in the Rangoon district alone. The adjoining districts of Bassein and Henzada both also suffered severely, and together show a mortality considerably above that registered in Rangoon. In both these districts the returns show cholera to have been prevalent, though very mildly, in the earlier half of 1872, and there is a trace of its presence in Bassein as late as November of that year. In the Prome and Thyetmyo districts the cholera of 1873 was less severely prevalent than in the other districts above mentioned of the Pegu division, judging from the number of deaths registered. The returns show the main force of the cholera of 1873 in this province to have been expended in the Pegu division, where altogether 6733 out of the total 8109 deaths in the province occurred. All the rest, excepting 11 in the Akyab district, occurred in the Tenasserim division, and in Moulmain alone the number exceeded those registered in all the other districts of this division together (see Table No. I.)

From the monthly returns for the several districts, the cholera of 1873 appears to have been active at the beginning of the year in the Rangoon, Bassein, Henzada, and Moulmain districts. During February the disease is shown as active in the Prome and Tavoy districts also, and in March in those of Toungoo and Thyetmyo. The course of the disease in the different districts differs much in point of seasonal prevalence, but the provincial figures show very clearly a double epidemic activity during the year. Beginning with the minimum prevalence of the year in January, the mortality (see Table No. II.) suddenly starts forwards in February towards a maximum, attained in March and maintained through April; the mortality then suddenly falls in May towards abatement in June. In July, however, there is a marked renewal of activity, and a second maximum prevalence is attained in that month; this is maintained at somewhat increased epidemic intensity during August; and then again, in September, there is a sudden and great fall in mortality; and this is maintained, the disease progressively diminishing in activity, until November, when a second minimum prevalence is reached. In December there is shown a slight tendency to renewed activity, but the year closes with cholera generally in abatement. The only districts showing cholera in markedly revived activity at the close of the year are those of Rangoon and Shwegyin; in Bassein and Henzada a similar tendency is observable, as also in Tavoy; whilst in Moulmain and Thyetmyo the revived activity commenced in October and November respectively.

The cholera of the preceding year, which, as before stated, was mostly confined to the Arakan division, had ceased in its northern districts of Akyab and Kyoukphyou or Ramree by the end of August; but in the southern district of Sandoway it was prolonged until the end of October; and in the Bassein district of the Pegu division, from which Sandoway is separated by a range of hills and a narrow belt along the sea-shore, a solitary death from cholera was reported in November. During December 1872 no cholera was reported anywhere in the province.

The first cases of cholera reported in 1873 appeared early in January almost simultaneously in the adjoining districts of Bassein and Henzada of the Pegu division, there being during that and the following month no signs of the disease in the Arakan division. In the middle of January cholera broke out in the villages on the banks of the Irrawaddy River, in the Rangoon district, with considerable violence, and caused 129 deaths from the middle to the end of the month; whilst in Bassein the deaths were only 10, and in Henzada 26, during the whole month. During January 8 deaths from cholera were reported, also, in the Moulmain or Amherst district, 1 of which occurred in Moulmain town. In February cholera was in full epidemic activity in all the districts previously affected, and the first deaths were reported in the towns of Rangoon, Bassein, Henzada, and Myanoung (in Henzada district). The disease appeared also in Prome, 3 deaths being registered in the town and 6 in the district; 61 deaths were registered during February in Moulmain, and the disease appeared also in the Tavoy district, 10 deaths being registered from it in Kadet Ngai, a village on the bank of the river, 18 miles below Tavoy. In the Tavoy district cholera was confined apparently to this village during February, and during March to it and the village of Eujonk Tseik, 12 miles higher up the river, and 6 miles below Tavoy town. The total cholera deaths in both villages during March were reported at 20. No cholera was reported farther south than the Tavoy district, the Mergui district remaining exempt throughout the year. The next deaths reported in the Tavoy district occurred in a distant Karen

village in March, where 8 deaths were reported in this month. No other cholera deaths were reported in the Tavoy district until December, in which month 21 were registered, of which 10 occurred in the town of Tavoy itself. "They were scattered over the town, in places far apart, and were of a very mild type." In March cholera appeared also in the districts of Toungoo and Thyetmyo; but the Shwegyin district, which intervenes between the already affected districts of Rangoon and Moulmain, to the south, and Toungoo, to the north, did not report the appearance of the disease until July. Cholera prevailed all over Pegu from the time it commenced in the several districts until the close of the year, except in Prome, in which district it ceased by the end of September; whilst in Thyetmyo district there was a lull in the activity of the disease during the month of October. In the Bassein district, in which the cholera of the year first commenced activity, the disease attained its maximum intensity in April, "when the wells were low and the water, generally speaking, at its worst, the previous year's rains having been lighter than the average." Of the total 8109 cholera deaths registered in the province during the year, 6733 occurred in the Pegu division, 1365 in the Tenasserim, and only 11 in the Arakan division; and of the total number only 885 were reported in the chief towns, which are all on the main lines of communication. It is noteworthy, also, that "although registration is correctly done in most of them, deaths from cholera were first reported in the districts."

Regarding particular outbreaks the following details are recorded. Apart from the first case in Moulmain town reported in January, and which is described as "an isolated doubtful case," the "first authentic case" is said to have occurred on the 6th February. It was "that of a Burman who had, with another, been dissipating and drinking toddy." This case was succeeded daily by others, and the disease continued throughout March, but less virulently than at first, until the 5th April, when the wind changed from south-west to north-east, and deaths again became numerous until the 20th April, when heavy rain fell, and the epidemic in the town may be said to have ceased, only 7 deaths being reported in the following month, and none at all during the months from June to September inclusive. In October cholera reappeared in the town and district. In the town there were 3 deaths in October, 2 in November, and 2 in December. The two last were European sailors, who were attacked on board their ships in the river, "having had premonitory diarrhœa, which was neglected for some days prior to their admission to hospital." Regarding the outbreak of cholera in the Moulmain jail, it is stated that the first case was that of a native of India, who was confined in the outpost jail at Moungan, and was employed with a gang on the river-bank breaking stones. He was sent into the Main Jail hospital on the 27th April, supposed to be suffering from simple diarrhœa. He died on the following day of cholera. The next case occurred on the 4th May in the Main Jail, in a prisoner under trial, who had been admitted the previous day on arrival from Pyapoon, in the Salwin district. From this time, it is stated, cases came in rapidly from all parts of the jail, the wards of which are all comprised in one continuous block of two storeys, forming three sides of a square; "but the civil prisoners, who occupied a ward about twenty yards from the above block of buildings on one side, and the female prisoners another ward on the opposite side, never had a case amongst them. ei ther was there a case in the deputy jailer's family, which occupied a house close to these wards." The sick were treated in a temporary hospital outside the jail. "None of the attendants on them were attacked; neither

was any of the guard." The disease ceased on the 24th May, when "as many prisoners as possible" were moved out of the jail. On the 11th October cholera, which had in this month reappeared in the town also, again broke out in the Moungan outpost jail, and caused 17 deaths. This second outbreak "apparently was put a stop to by bringing water from wells outside the jail." In both outbreaks there were 129 seizures and 63 deaths, out of an average strength of 850 prisoners. It is stated that "during the entire time that the disease prevailed in the jail there was not a single case in the town about the jail; neither was any member of the establishment or of the warder or police force attacked, although constantly in and about the jail."

Regarding the outbreak of cholera at Thyetmyo, it is recorded that after the appearance of the disease in Prome town and district in February, scattered cases appeared day by day during March in villages between Prome and Thyetmyo town, but that no case was reported at Thyetmyo until the 12th April, when cholera appeared in the cantonment among the European troops. On the following day, 13th April, a prisoner was brought to jail with cholera, which had attacked him on board the steamer between Prome and Thyetmyo. There was no cholera at that time in the Prome jail, and this case was not succeeded by others. On the 24th June the battery of Artillery was attacked, and on the 28th June cholera appeared in the jail, in a prisoner who had been an inmate for over three months, and the disease rapidly became epidemic. There were altogether 32 admissions and 19 deaths, and the disease ceased on the 29th July, "the prisoners remaining in the jail, and drinking the water obtained from the jail wells, which is very pure, the entire time, as it was impossible to move them into camp." All cases of cholera were at once removed from the jail, and treated in a temporary hospital outside. The total deaths in the town during this period, it is stated, was only 19. Regarding the weather during this outbreak, it is stated—

> That the rains were very late, and the temperature during April, May, and June was unusually high, ranging between the maximum of 108° and a minimum of 70° in the shade; that the sky was overcast, and wind southerly, and that "a blue mist constantly overhung the low hills close to the station, and that part of the station in which cholera was present."

In the Rangoon Central Jail, containing 2355 prisoners, cholera broke out on the 24th July. There were two seizures in the morning of that day, and both ended fatally the same afternoon. On the two following days there were 13 and 8 cases successively. The disease then began to abate, and ceased by the end of the month. In all there were 39 admissions and 15 deaths. "There was at the time a large gang of prisoners employed inside an enclosure on the river's bank in the town breaking stones, but no case occurred amongst them, the great majority of those attacked not having been outside the jail for a long time previously. The first two prisoners in whom the disease appeared were entirely employed within the jail walls. As the greatest number of cases were admitted from one block, it was closed and thoroughly fumigated at once, the prisoners who occupied it being distributed amongst the other barracks and in verandahs." Those affected by cholera were removed at once to a separate hospital; all excreta were immediately covered with carbolic acid and buried, and clothing and bedding which had been used by cholera patients were at once burnt. "As many animals were dying of disease at the time, all meat was stopped and salt fish substituted." Diarrhœa, it is stated, was very prevalent at the time. During the outbreak

all the jail wells were closed, and water was brought from outside. None of the attendants on the sick were affected by the disease.

Regarding the weather, it is stated that—

"The rainfall in May was comparatively small, and the total rainfall of the previous year was much less than the average; the consequence was that the hot season of 1873 was unusually prolonged, and the water-supply of the province derived from wells was more scanty than usual. The average temperature, also, at the beginning of the rains was high, in consequence of frequent temporary cessation of the rainfall, during which times it was universally noticed, when the epidemic began, that cases were most frequent, and that the number of deaths from cholera fell again when the rainfall was heavy; but, on the other hand, the greatest mortality was in the months of July and August, when the rains were heavy and the air was saturated with moisture."

As before stated, no cholera was recorded in the Mergui district during 1873; but it appears, from reports received, that the disease prevailed to a great extent in the kingdom of Siam, adjoining that district to the south, and that the city of Bangkok suffered severely from it.

The incidence of the cholera of 1873 among the troops and jails was as follows:—

Among the European troops, total average strength 1974, there were altogether 23 admissions and 12 deaths from cholera, viz.:—Thyetmyo, strength 583, admissions 20 and deaths 12; and Toungoo, 475, 3 and 0 respectively. Of the 23 admissions, there were 12 in April, 1 in May, 4 in June, and 6 in July. Among the families of the European soldiers, total average strength, women 250 and children 454, there were 2 admissions and 2 deaths among the women at Thyetmyo, strength 81, and 10 admissions and 6 deaths among the children at Thyetmyo, strength 162. Of the 12 admissions, there were 3 in April, 1 in May, 1 in June, and 7 in July.

Among the Native troops, total average strength 3597, there were altogether 2 admissions and 2 deaths from cholera. They occurred at Thyetmyo, strength 588. The dates of the occurrence of these cases are not traceable.

Among the jail populations, total average strength 4821, there were altogether 203 admissions and 97 deaths from cholera, viz.:—Moulmain, strength 916, admissions 122 and deaths 61; Thyetmyo, 408, 32 and 19; Myanoung, 63, 5 and 0; Rangoon, 2212, 39 and 15; Bassein, 380, 3 and 0; and Toungoo, 68, 2 and 2 respectively. The monthly distribution of these cases is not traceable.

The particulars of the outbreak of cholera in 1873 among the European troops at Thyetmyo are, as is observed by the Sanitary Commissioner, of interest in connection with the history recorded already of previous outbreaks of the disease in this station in former years. It is stated that "on the 12th April 1873, the regiment up to that period having enjoyed good health from the time of its arrival in Thyetmyo in the early part of last year, a case of cholera took place in the headquarter wing of the 45th Regiment," strength 442. This case was the wife of a soldier residing in No. 9 room of No. 11 family barrack of the European Infantry lines. The barrack contains fifteen quarters, and, like all the others, is built on a brick platform surrounded with a drain, and raised 10 feet from the ground. This barrack, as well as all the other barracks, is well ventilated, and the general sanitary condition of all is good. There was no overcrowding. The woman, who was a Roman Catholic, had been fasting on the previous day (Good Friday). She had gone to the bazar to make purchases, and among other things had bought a piece of Native pork, of which it is, however, stated she did not partake; but she supped heartily on raw onions and bread, and

went to bed apparently in good health, and is said to have "had one pint of porter only;" what she may have had when at the bazar could not be ascertained. Between 5 and 6 A.M. on the 12th April she wakened her husband to make some tea, and meanwhile went twice to the latrine. At 6.30 A.M. she went to hospital, when collapse set in almost immediately, accompanied with purging, vomiting, and cramps, and she died in that state about noon. The room in which she was taken ill, as well as the separate room in the female hospital in which she was treated, were after her death closed and fumigated, and the occupants of the rooms adjoining on each side the room she had occupied in No. 11 barrack were removed to No. 12 family barrack, distant about 250 yards, where they were placed in the centre of the building, with empty rooms between them and any other families. The latrine she had used was "at once closed and disinfected; straw bed and pillows burned. In this as well as other cases the urine tubs and latrine pans were burned and retarred, in addition to the ordinary mode of disinfection by M'Dougall's powder or chloride of lime," and the usual precautionary measures were taken.

No other case of cholera occurred until the 20th April, on which date a soldier was admitted from No. 7 barrack. He was removed to a tent pitched "at a convenient place near the river-bank." He died. The end of the barrack occupied by him was cleared, cleansed, whitewashed, and disinfected with Condy's fluid and sulphurous acid fumes. On the evening of the 21st April the bandmaster's daughter, aged 8 years, living in a detached bungalow, was admitted with cholera. She recovered. On the 23d, at 6.30 A.M., the wife of a soldier came to hospital from a room in No. 13 family barrack, "complaining of vomiting and purging, which soon passed into cholera," and she died at 1.30 P.M. on the 24th. She had been treated for simple diarrhœa on the previous day. On the 24th April a bandsman from No. 9 bungalow, who had performed with the band at mess the previous evening, and afterwards went "to hospital, not feeling very well, but not suffering from diarrhœa," and was detained for the night, was admitted to the cholera tents early in the morning, and became collapsed at 2 P.M. "Next day he amended, and on the 1st May was transferred back to hospital, whence he was discharged on the 8th." The occupants of No. 9 bungalow, as well as the family of a soldier with whom the above bandsman had spent the early part of the evening on which he had been attacked, "were at once removed to the camp previously pitched on the brigade parade-ground."

On the 28th April, at 1 A.M., a soldier was brought to the hospital tents with cholera from No. 5 bungalow, in one of the sergeant's quarters. He died at 3.30 P.M. the same day. On the same day, at 2.30 P.M., a soldier living in No. 12 room, No. 12 family barracks, was brought to tent hospital off guard, vomiting and purging. These symptoms, together with cramp, continued during the night; collapse set in about 8.30 A.M. on the 29th, and he died at 7 P.M. that day. "This man had been detained at hospital under the effects of drink (being then a prisoner) on the 25th and 26th, returned to the guardroom on the 27th, and went on duty at 6 A.M. on the day of attack." On the 29th April a soldier residing in No. 7 bungalow "was on duty with the fire-engine in the town of Thyetmyo; on the way back was attacked with vomiting and purging, was taken to the tent-hospital at 2.15 P.M., and died in collapse at 11.30 P.M. the same night." The occupants of this bungalow, as well as those of No. 12 family barrack, were ordered to cross the river to the camp at Tyrangoon on the morning of the 29th April. At 5 P.M. on this day a soldier from No. 5 bungalow was

brought to tent-hospital with cholera; he recovered. A soldier in No. 8 room and another in No. 13 room of No. 10 family barrack were also this day attacked with cholera; the former died at 5 P.M. the same day, the latter recovered. A lance-sergeant, occupying a separate room in No. 8 bungalow, admitted at 8.30 P.M. with diarrhœa, was kept under observation in a separate tent, and the same night removed to the cholera tent in partial collapse; he recovered. Among the party at Tyrangoon, a soldier of F. company, almost immediately on landing on the 28th April, was attacked with cholera; he recovered. "He had only that morning been discharged from hospital, where he had been treated for colic." There was no case again till the 12th May, when a soldier's child, aged 6 years, and living in No. 13 family barrack, was attacked with cholera between 6 and 7 P.M., and died in hospital at 7.30 A.M. next day. This barrack was at once vacated, and the occupants moved across the river to Tyrangoon.

At Tyrangoon some inconvenience was suffered from occasional showers, but all enjoyed good health. On the morning of the 31st May, the monsoon having set in, and seventeen days having elapsed since the last detachment was sent over, it was proposed to bring the party back to Thyetmyo; but the acting canteen sergeant there, and living in the canteen, having been attacked with cholera on the previous day, and died that same evening, the move back to cantonments was postponed. Meanwhile the heavy rains—

"Which beat through the roof and walls in many places" caused much discomfort to all, especially the married people, and had formed a large pool of water in the low paddy ground midway between the river and the barracks, draining the rising ground around, which was used as a latrine by the natives of the village, and giving rise to an offensive smell.

On the 1st June the second case of cholera at Tyrangoon occurred. The subject was a child aged 2 years and 2 months, the daughter of a colour-sergeant. The child died eight hours after attack. The next case here occurred on the 6th June, on which date, at 3 P.M., a soldier who had suffered from diarrhœa since the previous day was attacked with cholera; he recovered. On the 19th June, no other case having occurred, and the men being uncomfortable, and besides "they were drinking to excess," the Tyrangoon detachment was moved back to cantonments. On the 17th July, eighteen days after the return of the detachment from Tyrangoon, and one month after the occurrence of the last case of cholera in the regiment, a prisoner from the cells was admitted to hospital at 10 A.M. with cholera. He had suffered from diarrhœa since 6 A.M. that day; he died on the 9th July. He had been a prisoner since his return from Tyrangoon on the 19th June; had been detained in "hospital for a day or two on first arrival, being unfit to go before the commanding officer from the effects of excess in drink;" was confined in the guardroom till the 2d July, when he was transferred to the cells by sentence of court-martial. "The cells are very clean and well-ventilated buildings, and there were at the time two other prisoners, neither of whom has suffered from any suspicious symptoms." Cholera had been prevalent in the lines of the Royal Artillery from the 19th June, but there had been no communication between them and the cell-prisoners of the 45th Regiment. On the 23d July two fresh cases of cholera, both fatal, occurred. One was a soldier in No. 6 barrack, and the other a child in No. 10 family barrack. On the 24th and 25th July 1 case occurred each day; both recovered. The first was a child from No. 4 barrack, and the other a young woman, aged 16 years, from No. 10 family barrack. The next, and the last case in H.M.'s 45th Regiment, was a child who "was attacked in the build-

ing used as a female hospital, where his mother resides as matron; he also recovered."

In no single instance, it is stated, did the attendants on the sick contract the disease themselves, though the "employment of soldier orderlies was necessary on account of the difficulty of procuring natives." They were provided with separate tents and isolated from "their companies till all danger of carrying the disease had passed away."

Cholera did not appear among the Royal Artillery, strength 147, till the 19th June. On the morning of that day two Native children were attacked by the disease in the syces' lines. On the 24th 2 fresh cases were brought to hospital, 1 a child from the syces' lines, the other a syce living in the commanding officer's compound, where he had been resident for several weeks. On the 25th 2 more cases, also children, occurred in the syces' lines. The first case among the Europeans occurred on the 24th June. On that day, at 7 P.M., a gunner who had suffered from diarrhœa since 5 A.M. was admitted to hospital with cholera from No. 1 barrack. He died at 8 A.M. the next day. On the 25th, at 6 A.M., a driver from No. 2 barrack was admitted with cholera, and died at 11 P.M. the same day. At the same time a bombardier, who slept in a bed next to the preceding case, was admitted on account of a sharp attack of diarrhœa, which, in spite of various remedies, continued till the 27th, when, at 2 A.M., he was seized with cholera; he recovered. No fresh case occurred till the 5th July, when the disease reappeared in the syces' lines, where 1 case occurred on that day, 2 more on the 6th, and 6 on the 19th July, on which day the epidemic ceased among the Native followers. Among the Europeans the disease reappeared on the 8th July, on which day 3 cases occurred among the children of soldiers. Of these, the first was admitted at 6 A.M. from the staff-sergeant's quarters, and the 2 others simultaneously at 4 P.M. from the family quarters; all 3 cases proved fatal. On the 11th, at 11 P.M., a gunner was admitted with cholera, and died at 7 A.M. next day. He was in charge of the coffee-shop in No. 2 barrack, and slept in the verandah in front of it.

A lull followed till the 18th July, when, at 5 P.M., a driver who had suffered from diarrhœa since 1 P.M. was admitted. He passed into collapse at 6 A.M. the next day, but finally recovered. The last case in the epidemic occurred on the 24th July, when, at noon, a gunner was admitted from the married quarters with cholera; he died at 10.30 P.M. the same day. There was, it is stated, premonitory diarrhœa in most of the cases.

Altogether, in H.M.'s 45th Regiment there were 23 cases and 13 deaths, and in the Royal Artillery 9 cases and 7 deaths, inclusive of women and children. Among the Artillery camp-followers, strength 379, there were 21 cases and 9 deaths. In the Native Infantry Regiment, strength 588, there was a single case, and it proved fatal. It is stated that at the season of this outbreak damp winds blew at night, as usual, and protection against them was provided by mat-screens.

Regarding the meteorology of the year 1873 in this province, it is stated that the temperature of the first five months of the year was higher than usual. The highest temperature recorded was 112° at Thyetmyo in May, and the lowest 54° at Akyab in January. The temperature and rainfall at Rangoon, which suffered severely from cholera, and at Akyab, which escaped the disease, are shown in juxtaposition in the subjoined statement for the sake of comparison:—

1873.	Rangoon.					Akyab.				
	Thermometer.				Rainfall. Inches.	Thermometer.				Rainfall. Inches.
	Mean.	Maximum.	Minimum.	Mean Max. Solar.		Mean.	Maximum.	Minimum.	Mean Max. Solar.	
January	78	87	73	143	...	73	77	54	131	...
February . . .	83	89	76	146	...	76	86	56	138	...
March	71	93	74	148	...	81	87	62	144	...
April	95	99	77	157	3·0	88	92	68	148	1·7
May	88	96	75	154	2·9	87	93	71	149	14·2
June	86	91	78	145	28·9	81	86	75	125	39·8
July	83	89	75	128	35·7	80	81	75	137	39·8
August	83	89	78	135	18·2	82	85	75	138	43·8
September . . .	88	86	77	134	20·1	78	86	73	134	20·8
October	89	92	75	138	16·3	81	89	73	139	18·0
November . . .	83	85	72	157	6·0	83	81	69	135	1·5
December . . .	80	85	73	119	...	74	82	65	137	...
Means and Totals	84	90	75	142	131·1	80	85	68	137	179·6

The figures show a generally higher temperature and lesser rainfall in Rangoon, and a generally lesser temperature and higher rainfall in Akyab.

In Bassein and Moulmain, where cholera was also prevalent more or less throughout the year, excepting an intermission in Moulmain during August and September, the temperature and rainfall are given as shown in the subjoined tabular statement :—

1873.	Bassein.					Moulmain.				
	Thermometer.				Rainfall. Inches.	Thermometer.				Rainfall. Inches.
	Mean.	Maximum.	Minimum.	Mean Max. Solar.		Mean.	Maximum.	Minimum.	Mean Max. Solar.	
January	77	89	49	127	...	73	83	62	143	...
February . . .	81	94	63	120	...	79	86	70	152	...
March	83	98	65	125	...	79	88	70	152	...
April	87	95	73	127	2·7	83	90	76	141	8·5
May	88	97	75	122	5·9	82	92	75	147	15·2
June	80	86	74	129	6·7	78	86	74	134	38·9
July	85	82	76	130	31·1	76	79	74	118	61·4
August	85	88	75	132	18·5	77	80	74	138	34·7
September . . .	82	86	75	152	27·1	77	79	75	140	44·3
October	85	85	73	156	8·1	80	84	75	150	8·4
November . . .	86	91	74	160	8·2	78	87	74	151	1·1
December . . .	85	101	62	157	...	75	85	65	148	0·2
Means and Totals	84	91	69	136	106·3	78	85	72	143	212·4

Compared with the figures for Akyab, the returns for Bassein show a generally higher temperature and lesser rainfall for the year; whilst the returns for Moulmain show a considerably higher rainfall than at Akyab, but a somewhat lower mean temperature in the shade, though in the sun's rays the mean temperature was considerably higher than at Akyab. The abatement of cholera in Moulmain during July and its absence during August and September was coincident and contemporaneous with heavier rainfall and lower temperature in those months than in the three months

either preceding or following. The principal activity of the cholera epidemic was in the months of February and March, which were marked by absence of rain and by high temperature in the sun's rays. In April, when the first rain fell and the temperature diminished in the sun's rays, the activity of the epidemic commenced to decline.

Regarding food-supply, it is stated that every article of food used by natives of Burma was cheap and plentiful. The rice crop was very large in 1872, and was even larger in 1873; "but in consequence of the apprehended scarcity in Bengal, the price of rice had begun to go up considerably above the average towards the end of the year, but not to such an extent as to cause any distress."

'1874.—In this year there was a very marked abatement of cholera in this province; the disease, in fact, subsided into general quiescence, as was normally due in this the third year of the triennial cycle 1872–74. Among the civil population the cholera death-rate of 1874 was 0.35 per mille of population against 2.99 in the year before. This marked abatement in the prevalence of cholera in 1874 was coincident with a very deficient rainfall, the amount for the year being about 11½ inches less than that of 1873, and 15 inches below the average, and with food at very cheap rates and plentiful.

Comparing the course of cholera in 1874 with that of the disease in 1873, we find that the epidemic, which was active at the close of the latter year in the districts of Rangoon and Shwegyin, and to a lesser extent in those of Bassein, Henzada, Moulmain, and Tavoy, continued active in all of them during the earlier months of 1874, but with a generally declining tendency. In Tavoy the disease ceased by the end of February, in Henzada in April, in Bassein and Moulmain in June, in Shwegyin in July, and in Rangoon lingered on until September, with a final solitary case appearing in November. On the other hand, the disease made its first appearance in the year in Akyab district, in the north, in May, and in Mergui, in the south, in the same month, and in each ran a mild and short course, terminating in July, but with a subsequent reappearance in each district—in Shwegyin in October, and in Akyab in December. With the exception of a few scattered deaths from the disease in Prome and Thyetmyo, there was no other cholera recorded in this province during 1874. Taking the monthly deaths for the province (see Table No. II.), we find the highest mortality in January, and thereafter a steady decline until April, when a fresh impetus caused a sensible rise in the mortality of that month; the disease subsequently resumed its course towards abatement, and finally subsiding to minimum prevalence in August, continued at that low rate of activity to the close of the year. The cholera of 1874 was merely the conclusion of the epidemic of the preceding year, and with the exception of the Akyab and Shwegyin districts, appeared in no previously unaffected areas of those under registration. In Toungoo the cholera of 1873 ceased in January 1874, and there is no record of the reappearance of the disease in this district during the remainder of the year.

Regarding the appearance of cholera in the principal towns, the following records appear:—

In Rangoon, population 19,579, there were 12 deaths registered from cholera, or at the rate of 0.13 per mille. "Cholera, when it visits the place, almost always appears in the hot dry months, and the greatest prevalence has occurred in seasons in which there has been a marked deficiency in the usual fall of rain; however, as a rule, only occasional or sporadic cases are met with in this place."

In Moulmain town 17 cholera deaths were registered during the year. "These were isolated cases," and occurred in the first five months of the year, but chiefly in March (8) and April (4); a solitary death from cholera was also reported in October.

In Sandoway town a single death from cholera was recorded in 1874; it occurred in March, "in an old, emaciated, and debilitated woman, who was suffering long from dyspepsia." This was the only case of cholera reported in this district.

In Bassein town 17 deaths from cholera were registered, but no details are mentioned.

In the Mergui district cholera was confined to the Malewoon township, lying on the Pakchang River. The disease was prevalent at the time of its appearance here in Takoopah, a station in Siam. A number of Selongs are said to have died of cholera in the islands forming the archipelago; "these people have no permanent abiding-place, but roam about from one island to another in boats, and are exposed to all the vicissitudes of weather."

The incidence of the cholera of 1874 among the troops and jails was as follows:—

Among the European troops, total average strength 2007, there was only 1 admission and 1 death from cholera, viz., at Thyetmyo, strength 692, in April. Among the families of the European soldiers, total average strength, women 242, children 452, there was no cholera in 1874.

There were a few cases of cholera among the prisoners in the jails. "All these cases, with the exception of that at Rangoon, occurred at the beginning of the year, and were clearly (especially in Moulmain and Tavoy) the last cases of the epidemic of 1873."

The rainfall of 1874 was less than that of 1873 and of 1872 (see Table No. V.), in which years themselves the fall was below the average. Regarding food-supply, there appears to have been abundance of food of all kinds.

1875.—In this year, the first of the new cycle 1875–77, cholera apparently, instead of renewing epidemic activity, prevailed with even less force than in the preceding year (see Table No. V.) The cholera of 1874, as we have seen, was a continuation of the epidemic of 1873; but it had generally ceased everywhere as an epidemic by the end of July, only a few cases, scattered at wide intervals of time and space, being recorded during the subsequent months; and the year closed with no cholera reported in any part of the province during December, except in the one district of Akyab, where 7 deaths were registered. The year 1875 commenced with cholera in absolute abeyance throughout the province during January and February, no deaths being recorded anywhere in this period, excepting 1 in Moulmain in January. During March only 8 cholera deaths were recorded in the whole province; of these, 4 were in Akyab and 4 in Bassein. But in April the disease made its appearance in the Moulmain district, and in it alone, of all parts of the province, ran a steady but mild epidemic course, which terminated in August. During June 3 scattered deaths were recorded in Akyab district and 4 in Bassein; lastly, 2 deaths were reported in Prome district in September. These are the only records of cholera in all the province up to the end of October; and up to this time the Moulmain district was the only part of the province in which the cholera of 1875 manifested itself in persistent epidemic activity; and here, from April to August inclusive, 108 deaths from the disease were registered, whilst the total of cholera deaths registered in the whole province up to the end of September was only 126. In October no cholera was recorded anywhere; but in November the disease

broke out in Rangoon, where it caused 29 deaths in that month. No other part of the province recorded cholera in November; but in December, whilst rapidly increasing in Rangoon, the disease broke out with more or less epidemic activity in all the other districts of the Pegu division, excepting Thyetmyo, and appeared also in the Moulmain, Tavoy, and Shwegyin districts of the Tenasserim division. The total cholera deaths registered in December amounted to 606. The Arakan division was not affected by this outbreak.

The cholera of 1875 in this province, as shown by the monthly district returns, commenced in April in the Moulmain district, and remaining confined to this district, there ran a mild epidemic course, which terminated in August with 3 deaths, out of the total 108 of the outbreak in that month. With the exception of 2 deaths in September in Prome, no other cholera was recorded, after the cessation of the disease in Moulmain, until the outbreak in Rangoon in November. And this outbreak, commencing two full months after the cessation of the disease in Moulmain, was the starting-point of the epidemic, which in the following month overspread the Pegu and, to a lesser extent, Tenasserim divisions, and by its extension into the following year constituted the cholera epidemic of 1876. It appears, therefore, that the cholera of 1875 was, in the normal periodic course, a newly revived epidemic cholera, but that, coming later than due, its effects were not felt till the next year; and that consequently, so far as concerns statistical results, its incidence in 1875 exhibits an apparently abnormal death-rate and a deviation from the normal periodic course; whereas, in reality, the difference is only that of a few months' delay in the advent of the normally due epidemic activity of the disease.

Regarding the commencement of the outbreak in the Rangoon district and the neighbouring one of Thonegwa, it is stated that the disease appeared on the 3d November simultaneously in the district of Thonegwa and in the town of Rangoon, and that the cases in the town appeared on the river-bank. According to the civil surgeon's report, "the majority of the deaths attributed to cholera were cases of chronic diarrhœa in ill-fed, filthy coolies, natives of India, who come to Rangoon during the shipping season, and live on the cheapest kind of food obtainable." In the town of Maoobeng, the head-quarter station of the Thonegwa district, only 2 cases occurred, but 206 deaths were registered in 35 out of the 670 villages in the district. In Rangoon town the total cholera deaths registered amounted to 61; in the district the number was 164 in 37 out of the 539 villages in the district.

In the Bassein district the first death from cholera was reported in the town; it occurred on the 12th December in a healthy girl, who died a few hours after being attacked. This case was rapidly succeeded by other fatal cases, and 11 died on the 16th. "All the cases were on the river's bank, and within a circumscribed area." The first death in the district was recorded on the day after the appearance of the disease in the town; the deaths in the town were 66, and in the district 54, but the number of villages attacked is not given.

In Henzada district the date of the first death reported was 1st December, and of the last 14th December; total deaths 55, in 12 out of the 240 villages in the district.

In the Prome district, of the 10 deaths registered the last was on the 14th December; they all occurred in the district, but the number of villages affected is not given.

In Tavoy district, of the 25 deaths registered 3 occurred in the town. The first death is stated to have occurred on the 23d November, and the

last on 30th December. The 22 deaths in the district occurred in 22 out of the 32 villages in the district, or one in each.

In Shwegyin district only 2 deaths were reported, 1 in a village in the district on the 5th, and the other in the town on the 7th December.

The rainfall of 1875 was altogether exceptionally abundant; it exceeded that of 1874 by more than 28 inches, and was about 13½ inches in excess of the average. The excess fell entirely in the south-west monsoon season, and seems to have acted as a check upon cholera activity by supersaturating the soil and air with moisture at the same time that it reduced the temperature.

1876.—In this year cholera prevailed with epidemic activity in continuation of the periodic revival of the disease at the close of the preceding year. The death-rate of the disease in 1875 amongst the civil population was 1.28 per mille of population against 0.26 in the preceding year. This activity of the cholera of 1876 in British Burma was coincident with a season of severe drought following upon a year of exceptionally heavy rainfall, a condition favourable to the rapid evaporation of moisture from the soil, and to sudden alterations of temperature and humidity of the air. Tracing the course of the cholera of 1876 by the district monthly mortality returns, the figures show that the cholera, which commenced activity during December, or in the latter part of November, of the preceding year in the Pegu division generally, and in the northern districts of the Tenasserim division partially, was continued, at a declining rate of prevalence, into 1876 in almost precisely the same area, the deaths in January falling to 256 against 606 in the preceding month, and in February sinking still lower, the number registered being 119, whilst no new area recorded the appearance of the disease. In March the returns show a general increased activity of cholera in the previously affected area, and also its appearance in the Akyab and Kyoukphyou districts of the Arakan division, to the north—in the Akyab district in considerable epidemic force—and in the Moulmain district of the Tenasserim division, to the south. During April this increased activity was maintained, with a somewhat growing tendency, over the general area affected, though with variations of rise and fall in its different districts, the deaths, which had risen from 119 in February to 558 in March, having amounted to 645 in April.

In May there occurred a sudden, general, and very remarkable check to the progress of the disease, the mortality in this month having fallen to only 56 deaths registered (see Table No. II.) In the following month, however, cholera burst out afresh, with greatly increased intensity, in all the previously affected districts; but its appearance was recorded in no new areas; and the mortality in June rose to the monthly maximum of the year, 676 deaths registered. In July this sudden explosion expended itself, and the returns show a cessation of the disease everywhere, except in the three districts of Kyoukphyou, Henzada, and Prome, which together contributed the entire mortality of the month—308 deaths registered—viz., Kyoukphyou 219, Henzada 76, and Prome 13. During August, with the exception of 8 deaths in Thyetmyo, the returns show the disease confined to the same three districts as in the preceding month, with a total registered mortality of 248, of which number 189 deaths were contributed by the Kyoukphyou district.

In September the returns show cholera active in Kyoukphyou and Prome, to have reappeared, after an interval of two months absence, in Akyab and Rangoon, and to have appeared for the first time in this year in the Sandoway district, the mortality of the month having risen to 401 deaths registered. In October cholera was active only in the districts of the Arakan division;

in the Tenasserim division there is no record of the disease after the month of June; and in the Pegu division the only districts which show the presence of cholera in October are Rangoon, with 9 deaths, and Henzada, with 11, the total mortality of the month being 104 deaths registered. In November the mortality fell still lower, to 91 deaths, of which all but 9 were registered in the Arakan division; and of these 9, after a blank interval of one month, 6 were returned from Prome. In December cholera abated sensibly in the Arakan division, but broke out afresh in all the districts of the Pegu division, excepting Thyetmyo, and made its appearance also in the Toungoo and Tavoy districts of the Tenasserim division; the total deaths of the month being 225.

It thus appears that the cholera of 1876 in this province, which was in activity at the beginning of the year in Pegu and Northern Tenasserim, and which commenced activity in Arakan in March, had completely subsided into quiescence by the end of June in Tenasserim and all the districts of Pegu, excepting Henzada and Prome, but continued its activity in Arakan to the close of the year, when, in December, the disease was again revived in Pegu generally and in Northern Arakan partially. The epidemic cholera of the first half of this year may be considered as a continuation of the deferred revival of cholera activity which commenced at the close of 1875, but which was due in the normal periodic recurrence of the disease in epidemic form at an earlier portion of that year. In this view of the case, the course of the cholera in 1875 and 1876 will not be much out of the normal course for those years of the triennial cycle ending 1877. Regarding the diffusion of the cholera of 1876 in the districts, it appears that in Akyab, out of 4877 villages, 116 recorded cholera; in Rangoon 37 out of 1254 recorded the disease; in Thonegwa 29 out of 737; in Henzada 393 out of 2438; and in Thyetmyo 10 out of 851. In the other districts the number of villages recording the disease in this year is not given.

Regarding the dates of the appearance of the cholera of 1876 in the districts and their chief towns, the following details are recorded:—In Akyab the first case was reported in the district on the 2d March, and in Akyab town on the 27th of the same month. In Rangoon district the first case was reported on the 29th January, and in the town not till the 29th June. In Thonegwa the first case was reported in its chief town, Yandoon, on 6th January, and in the district on the following day. In Bassein the dates were 1st January in the district, and 12th March in the town; in Henzada district 2d January, and town 7th March; in Kyanghin town and Myanoung town, both in Henzada district, the dates were respectively 8th and 3d January. In Prome cholera appeared in the town on the 18th and in the district on the 13th January; but in the towns of Poungday and Shwedoung, also in this district, the disease did not appear till 12th March in the latter and 10th April in the former. In Thyetmyo the dates were 8th January in the district, and 2d March in the town; in Moulmain district 4th March, and town the 9th; in Tavoy, town 4th and district 9th January; and in Toungoo, both town and district on the 4th December.

1877.—In this year there was a continuation of epidemic cholera greatly more severe than that of the preceding year—quite contrary to the normal course for this the third year of the cycle. The death-rate of the disease in this year among the civil population rose to 2.47 per mille of population against 1.28 in 1876. This increased prevalence of cholera in 1877 was coincident with a great increase in the rainfall following upon a year of deficient rainfall and severe drought. The rainfall of 1877 was about

22½ inches in excess of that of the preceding year, and it was also about 12¾ inches above the average; the excess fell entirely during the period of the south-west monsoon, and more largely in its later than earlier half.

Comparing the monthly returns with the corresponding statements for the preceding year, the cholera of 1877 in this province is shown to have been a continuation of the revived epidemic which commenced towards the close of 1876. The year 1876, we have seen, closed with a newly revived outbreak of cholera activity during December in each of the three great divisions of the province, but with greater intensity of prevalence in the central and northern divisions than in the southern. The year 1877 opened with the disease in progressive activity during January in the areas previously affected, the mortality of the month having risen to 447 deaths against 225 registered in the preceding month. The only districts not recording cholera in January were Sandoway, in Arakan, and Shwegyin and Mergui, in Tenasserim; in the Toungoo district only 3 deaths appeared in January, and then no others until October, in which month also the disease made its first appearance in Shwegyin; in Mergui cholera appeared first in May, and in Sandoway not until July. It thus appears that these districts remained exempt from the generally prevailing influence for four months in the case of Mergui, six in that of Sandoway, and nine in the instances of Shwegyin and Toungoo, excepting only the 3 deaths recorded in the latter in January.

During February cholera continued active at much the same rate of fatality as in the preceding month, and was confined to the general area previously affected. In March, without extending beyond its previous limits, cholera acquired increased prevalence, and the mortality rose to 671 deaths against 472 registered in the preceding month. In April, again, although the disease had ceased in the Tavoy district, and was reported in no fresh area, the mortality rose further to 735 deaths. In May cholera continued active in all the previously affected districts, excepting Tavoy, and appeared for the first time in Mergui with 8 deaths registered in this month; the disease, however, was decidedly on the decline, the mortality of the month having fallen to 674 deaths. This abatement, commencing in May, was continued through June, and though the disease had not ceased in any of the affected districts except Tavoy, the mortality fell to 355 deaths. In July there occurred a sudden and considerable renewed activity of cholera in the districts already affected, and the disease appeared for the first time in Sandoway with 8 deaths recorded during the month; the total mortality registered in July amounted to 832 deaths against 355 in the preceding month, and this was the highest number attained in any month during the year. In August there was a slight decline in the mortality; and in September, when, after an absence of five months, the disease reappeared in Tavoy with 13 deaths, the decline was more marked, the deaths falling to 645 from 740 in August. During October, whilst still active in the previously affected districts, cholera made its first appearance in the Shwegyin and Toungoo districts (excepting the 3 deaths recorded in the latter during January) with 43 deaths in the former and 31 in the latter, the total mortality of the month being thereby raised to 662 deaths; whilst the decline of the disease in the previously affected districts is represented by the 588 deaths registered in them against 645 in September. During November the mortality was 589 deaths, of which number 107 were contributed by the two districts newly affected in the preceding month, thus leaving 482 to represent the decline of the epidemic in the previously affected districts, each of which still recorded the presence of cholera. In December there was no record of cholera in the Arakan district, nor in the Tavoy district of Tenasserim; but all the other

previously affected districts recorded the continued presence of the disease; and the total mortality of the month was 464 deaths, of which 44 were contributed by the two last affected districts, thus leaving 420 deaths to represent the prevalence of the epidemic in the 8 districts still showing the presence of the disease, cholera having ceased in the other 4 districts affected at the close of the preceding month. The results show a renewal of cholera activity in December in the 8 districts still having the disease present, and most markedly in the districts of Thonegwa and Moulmain, where the deaths rose respectively from 22 and 55 in November to 122 and 111 in December.

The year 1877 commenced with 447 cholera deaths in January, and ended with 464 in December. The disease attained a first climax in April, suddenly subsided to the minimum prevalence of the year in June, and as suddenly bounded up to the second climax of the year in July. Thereafter the epidemic commenced a steady decline, which was continued until the outbreak of the disease in the northern districts of Tenasserim during October caused a fresh rise in the cholera mortality of the province during that and the succeeding month. Finally, the revived activity of cholera during December in the Pegu districts generally, and in those of Tenasserim, mark the commencement of a fresh epidemic to run its course in the coming year.

There was a good deal of cholera in this year among the troops and prisoners in jails.

The outbreak of cholera in this year among the European troops at Thyetmyo occurred in the month of September, "a very unusual period for cholera to appear in this locality." The disease had been prevalent in the Native town for five or six weeks before it attacked the European troops, and in August 13 cases and 6 deaths were reported in the bazars of the station. It is recorded that "on the 6th September a very rapid rise in the river flooded the lower parts of the cantonment," and that "for some days after a sickening and offensive smell arose from the silt left by the retreating waters." On the 8th September a lascar of the Royal Artillery, who "had been drinking in the bazars," was admitted into hospital with cholera. This was the first case observed in cantonments. The next occurred on the 14th September, when a bombardier was attacked. He died on the 16th. He had been visited on the 15th by two soldiers' wives, and on the 18th the child of one of them was brought to the hospital with cholera, and on the same day another soldier's child, who had been playing with the first child attacked on the previous day, was also taken to hospital with cholera. At this time a woman of the 89th Regiment and four children were detained in the hospital for the day. These children were playing in close proximity to the child Sibson (the second admitted with cholera) and the cholera discharges, but were very soon sent home to their quarters. About 10 P.M. on that night, the 18th, one of these four children was admitted with cholera, and died. No other case occurred in that family. But before these cases, and without any communication with either of them, two children of the commissariat-sergeant, who lived a mile away from the barracks, were attacked with cholera on the 14th September, and another on the 15th. On the 22d September a woman in hospital expecting her confinement when the child Sibson was admitted, and who had visited it while under treatment in another ward, got cholera and died. On the 18th September a driver was admitted to hospital very drunk, saying he had cholera. On the 19th, however, he was well, but on the 20th he was actually seized with cholera. This man came from the same barrack-room as the bombardier who died on the 16th, occupying the next bed but one. In hospital "he was put into a ward next

to the one in which the bombardier had died on the 16th, but which had been fumigated, and was then closed." Two children of the soldier's wife who was guardian of the child Sibson were admitted, one on the 20th and one on the 21st, and two other children of the same family, one on the 24th and one on the 25th. Again, a soldier's wife who had visited the bombardier on the 15th, and whose child had died of cholera on the 18th, was herself admitted with cholera on the 26th September.

In the 89th Regiment a soldier who was in the habit of visiting the hospital to see the schoolmaster of the regiment was attacked on the 22d September, and died. On the same day a patient in hospital for gonorrhœa was attacked, and died the next day. On the 24th the regular hospital orderly was seized with cholera, and on the 25th two orderlies in attendance on a case of hepatic abscess were attacked, though the patient had been moved into camp the day before, the hospital having been vacated on the 24th. These were the last cases in the 89th Regiment; but cases occurred in the Royal Artillery until the 3d October.

1878.—In this year, the first of the triennial cycle 1878–80, cholera continued to prevail with marked epidemic intensity, and apparently with a fresh renewal of epidemic activity. The cholera death-rates for 1878 among the three different classes indicate a very decidedly increased prevalence of the disease over that experienced in 1877; but among the civil population the results of the registration give a death-rate much about the same in both years, with, however, a slight abatement in 1878. On the whole, the cholera of 1878 may be considered as a newly revived epidemic, as was due in this year in the normal periodic recurrence of the disease. The severe epidemic activity of cholera in this province during 1878 was coincident with a season of excessive drought following upon one of more than average rainfall. The rainfall of 1878 was about 36 inches less than that of 1877, whilst that of 1877 was about 22½ inches more than that of 1876. With these differences in the rainfall, the epidemic activity of cholera was very much the same in point of severity during both the years compared, and the reason seems to be that the conditions of soil and atmosphere, notwithstanding the difference in rainfall, were much the same in both years; that is to say, in 1877 an unusually heavy rainfall followed upon a season of drought (see Table No. V.), and thus favoured rapid evaporation from the soil, with sudden and great changes in the temperature and humidity of the lower strata of the atmosphere. In 1878 the same sort of changes were produced by a season of drought following upon a year of excessive rainfall, by which the soil was supersaturated with moisture. This explanation accords with the results of rainfall and cholera prevalence in their relation to one another observed to obtain in other parts of India, and is confirmatory of the opinion that cholera prevalence is directly influenced by the effects of rainfall upon the soil.

Comparing the district monthly mortality returns for 1878 with the corresponding statements for the preceding year, the figures show that the cholera of 1878 in this province was quite as widely diffused and generally prevalent as that of 1877. The disease, which sprang into revived activity at the close of 1877 in Pegu and Tenasserim, continued in epidemic prevalence in all the districts of these two divisions at the opening of 1878, and the total mortality in January was 573 deaths against 464 registered in the preceding month. During the next three months, excepting a few stray cases in the Akyab and Sandoway districts of Arakan, cholera remained confined to the Pegu and Tenasserim divisions, and in the latter had entirely ceased in Tavoy and Mergui districts by the beginning of February. The main prevalence of the disease throughout these months up to April inclusive

was confined to the Pegu division, but with a general tendency to abatement everywhere during February and March, represented by a fall in the mortality to 396 deaths in February and 340 in March. In April there was a sensible revival of cholera activity, and the deaths rose to 391 registered in that month, including 12 reported from Tharawadi district, in Pegu, now for the first time recording the appearance of the disease. In May cholera broke out in the Akyab and Kyoukphyou districts of Arakan, and together they contributed 152 out of the total 457 deaths registered in this month, the Moulmain district of Tenasserim alone contributing another 145 of the total number. In June, whilst actively prevalent in the recently affected districts of Arakan, the disease flared up with considerable force in the Rangoon, and with lesser force in the Thonegwa districts of Pegu, but was in marked decline or abeyance everywhere else; and the total deaths were 593 against 457 in the preceding month. In July, with continued prevalence in the affected Arakan districts, cholera attained its maximum intensity in Rangoon, and flared up in epidemic force in Tharawadi, the total mortality of the month rising to 1071—the climax of the epidemic. In August the cholera of the year commenced to abate generally; in Moulmain it had ceased entirely, and in Thonegwa, Henzada, and Thyetmyo, sank into abeyance, or to a minimum of prevalence; but in the Tharawadi district it attained its culminating point, marked by 204 deaths in this month, the total mortality being 617. In September the disease attained its climax in Kyoukphyou, and flared up into a moderate outburst in Prome, but elsewhere was in abeyance or very distinctly on the decline, and the total mortality fell to 491. In October cholera broke out for the first time this year (excepting 4 deaths recorded in April) in Sandoway district, the disease being still at maximum intensity in Kyoukphyou, and showed a tendency to renewed activity in Pegu generally, as well as in the Shwegyin district of Tenasserim, the mortality of the month rising to 507. In November the renewed activity of the preceding month was continued everywhere, except in the three southern districts of Tenasserim, in which cholera had already ceased several months previously, and the mortality of the month rose to 742—the second climax of the year. In December cholera again commenced to abate, but was still active in several districts; and the year closed with 581 deaths in this month.

The districts showing the disease in most activity at the close of the year were Akyab, in the north of Arakan, Shwegyin, in the north of Tenasserim, and all the districts of Pegu, excepting Henzada, Tharawadi, and Thyetmyo.

The year 1878 commenced with 573 cholera deaths registered in January —the climax of the outbreak which began in the preceding month—and terminated with 581 in December—the first fall from the culminating point attained in the preceding month. Taking the monthly figures of the provincial mortality (see Table No. II.), they represent the cholera of 1878 as prevailing in three successive epidemic outbreaks during the year. The maximum mortality, or climax, of the first, which commenced towards the close of the preceding year, was attained in January; that of the second, which commenced in April, was attained in July; and that of the third, which commenced in October, was attained in November. The first epidemic outbreak sank to its minimum prevalence in March, the second to its minimum in September, and the third was on the decline when the year closed. It will be seen, farther on, that this third outbreak, in its turn, subsided in the following March.

The diffusion of the cholera of 1878 in the several districts of this province is shown in the distribution statement annexed hereunder:—

STATEMENT *showing the Distribution of Cholera for each District of the Burma Province for the Year* 1878.

No.	Districts.	Population.	Area in Square Miles.	Population per Square Mile.	Number of Registering Circles in each District.	No. of Towns and Villages in each District.		Number of Towns and Villages.		Date of		Period of Maximum Deaths.		Total Deaths Registered in each District.
						Towns.	Villages.	Affected.	Not Affected.	First Death.	Last Death.	From	To	
1	Akyab	299,900	5,337	56	132	Included with the villages.	1,892	32	1,860	17th Mar.	3d Dec.	24th May	30th June	853
2	Kyoukphyou	144,179	4,309	33	70		988	20	968	7th May	10th Nov.	7th June	30th June	643
3	Sandoway	56,342	3,667	15	37		429	2	427	26th Mar.	28th Oct.	11th Oct.	28th Oct.	22
4	Rangoon	392,415	4,258	92	71		1,365	29	1,336	1st Jan.	31st Dec.	1st July	31st July	1,183
5	Thonegwa	221,097	5,413	41	41		787	19	768	3d Jan.	26th Dec.	5th Jan.	30th Jan.	635
6	Bassein	318,555	7,047	45	82		1,445	28	1,417	7th Jan.	25th Dec.	28th Mar.	31st Mar.	781
7	Henzada	297,267	1,948	153	49		1,184	?	?	20th Jan.	26th Dec.	1st Feb.	28th Feb.	166
8	Tharawadi	245,818	2,014	122	34		1,346	20	1,326	13th July	26th July	15th July	15th July	693
9	Prome	308,982	2,887	107	129		1,674	10	1,664	1st Jan.	31st Dec.	1st Sept.	30th Sept.	751
10	Thyetmyo	149,825	2,397	63	42		853	5	848	12th Jan.	22d May	9th Feb.	18th Feb.	88
11	Moulmain	303,317	15,203	20	105		744	?	?	4th Jan.	28th Dec.	1st May	30th May	367
12	Tavoy	82,580	7,150	12	5		308	1	307	18th Feb.	19th Feb.	18th Feb.	19th Feb.	6
13	Mergui	55,068	7,840	7	22		199	3	196	8th Jan.	20th Dec.	8th Jan.	26th Jan.	26
14	Shwegyin	143,157	5,567	26	30		564	16	548	8th Feb.	29th Dec.	9th Nov.	11th Dec.	401
15	Toungoo	95,902	6,354	15	26		681	4	677	26th Feb.	18th Nov.	1st Aug.	1st Aug.	144
	Totals	3,114,404	81,361	38	875		14,459	189	14,270					6,759

Exclusive of Henzada and Moulmain, for which the information is not given, the returns show that 189 villages and towns, out of a total of 12,581, were visited by cholera. The total number of deaths in rural circles was 5137, and in towns 1622.

Regarding the outbreak of the disease in Akyab town, it is recorded (Sanitary Administration Report for British Burma for 1878) that, "unlike previous epidemics of cholera in the town of Akyab, the last commenced in that quarter of the town nearest to the station where the residences of the European merchants and officials are, all previous outbreaks of this disease having commenced along the banks of the Cherrogeah Creek, where the huts of the Chittagong coolies employed in the rice-mills are situated. The town and district of Akyab had been completely free from cholera since November of the previous year, and remained so until the 25th April, when a native of Chittagong, who had left Rangoon (where there had been 21 deaths from cholera during the week ending Saturday, 20th April) on the 21st April, and arrived at Akyab on the 24th, was attacked and died the same day of it in the quarter of the town before described." This, however, it must be here noted, was not the first death of the year from cholera in the town of Akyab; for the mortality returns show one death from cholera in this district registered in March, and the Distribution Statement shows that this death occurred in Akyab town on the 17th March 1878.

But to return to the Sanitary Commissioner's account, in continuation of the quotation above commenced—"The next case occurred ten days after, in the same house, on the 5th of the following month (May), the man dying on the 6th. There were 4 deaths in houses closes by on the 7th, and the disease increased in force until the 26th, on which day 12 were attacked, of whom 10 died. The disease caused 61 deaths amongst people residing in the neighbourhood of the house in which the first death occurred on the 25th April up to the 6th June. It spread from thence all over the town, the parts of the town nearest being attacked in succession as a rule. This epidemic caused the deaths of 235 males and 49 females from the date of the first case to the 31st July, and 10 deaths in August." Next follows the statement that—

"The disproportion between the number of males and females who died was because the disease was almost confined to the floating population, natives of Chittagong and India, who are, as a rule, unmarried males. They are very filthy in their personal habits, eat the cheapest kinds of fish and vegetables, live in houses without any ventilation, not raised from the ground, and are very careless as to the purity of the sources from whence they obtain their supplies of drinking-water. I saw them coming from a cholera-infected quarter (where the dejecta caused by the disease must have been plentiful on the ground), and walk into the tanks to fill their water-vessels. It is not, therefore, to be wondered at that they suffer so much more than the inhabitants of the country, who are more careful."

It must be noted here that inaccuracies and assertions without proof, such as are contained in the above quotations, are by no means uncommon in the Sanitary Reports, for this as well as for other provinces, for previous years, and sometimes the statements made are so contradictory, gratuitous, and irrelevant as to be quite useless. In the instance with which the above quotation concludes, it may be safely asserted that, whether more careful or not, the inhabitants of the country—granting, as assumed, that they suffer so much less from cholera than those of the town, although it is by no means sure that they do so—are, as a rule, better situated in respect to the ordinary conditions of life than the poor Indian emigrants who come to them in search of employment and food.

The Sanitary Commissioner next states that "the forms of returns prescribed by Government do not show the nationalities of persons dying of cholera; but I ascertained, whilst at Akyab, that of those who died up to the 10th June over 90 per cent. were natives of India and Chittagong." It appears, then, that after all, though the precise locality of the cholera outbreak of this year in Akyab town was changed from its usual site on the banks of the Cherrogeah Creek to another part of the town, still the people who were mostly affected by the disease were of the same classes and nationalities as suffered in previous years' visitations of cholera to this town. The outbreak in the town, it is stated, ceased in August, "when very heavy rain fell;" but the disease must have reappeared later on, for the last case of cholera in the town is shown in the Distribution Statement to have occurred on the 3d December, and in the district on the 29th November, the total deaths registered in these months being 58 and 26 respectively. The cholera mortality of the year in the principal towns is given as follows:—

Akyab	Pop.	21,046	Deaths	339	First on	17th March	Last on 3d Dec.
Rangoon	„	91,579	„	489	„	6th Jan.	„ 30th Sept.
Yandoon	„	9,051	„	64	„	11th Jan.	„ 18th Dec.
Pantanau	„	5,824	„	23	„	7th Jan.	„ 17th Dec.
Bassein	„	21,816	„	80	„	10th Jan.	„ 25th Dec.
Henzada	„	24,541	„	16	„	26th Jan.	„ 26th Dec.
Prome	„	31,157	„	375	„	1st Jan.	„ 24th Dec.
Shwedoung	„	5,390	„	86	„	4th Jan.	„ 31st Dec.
Thyetmyo	„	10,427	„	7	„	12th Jan.	„ 22d May.
Allanmyo	„	7,802	„	14	„	8th Feb.	„ 18th Feb.
Moulmain	„	54,333	„	79	„	4th Jan.	„ 28th Dec.
Mergui	„	11,347	„	2	„	16th Dec.	„ 20th Dec.
Shwegyin	„	7,626	„	26	„	8th Feb.	„ 29th Dec.
Toungoo	„	12,414	„	22	„	8th July	„ 1st August

The towns of Kyanghin, population 8681, Myanoung, population 5733, and Tavoy, population 14,823, recorded no cholera in 1878.

The incidence of the cholera of 1878 among the troops and jails was as follows:—

Among the European troops, total average strength 1793, there were altogether 9 admissions and 6 deaths from cholera, viz., at Rangoon, strength 763, admissions 6 and deaths 3; Toungoo, 408, 1 and 1; and Thyetmyo, 622, 2 and 2 respectively. Of the admissions, there were 2 in April, 6 in July, and 1 in August. Among the families of the European soldiers, total average strength, women 193 and children 387, there was only 1 admission and no death from cholera; it occurred among the children at Rangoon, strength 208, in December.

In the Moulmain jail there were two outbreaks of cholera during the year. The first commenced on the 2d May, and lasted till about the end of June. "The first prisoner attacked had been in jail for nearly two years, and was at the time employed in carting stones near the river's bank, cholera being slightly prevalent in the town of Moulmain at the time in the quarter adjoining the jail; the second was attacked on the 8th May; he was employed in the jail garden; . . . the third prisoner attacked was a sweeper employed in removing night-soil. He was not taken ill until the 20th, after which prisoners came in daily until 26th June. There were 55 admissions and 39 deaths from this epidemic. The first prisoners attacked died in a few hours." The second outbreak commenced on the 6th November, "attacking a man employed in carting stones also." In this outbreak 12 were attacked between the 6th and 18th November, of whom 8 died. "The

second man attacked was also a cartman; and it is likely, as the disease presented itself in him but a few hours subsequent to the first, that they were both poisoned from a common source and at the same time." The reason assigned for the disease not continuing to prevail throughout the epidemic amongst the outgang employed upon the river's bank in a more marked way is that "as soon as cholera becomes epidemic prisoners are not permitted to go outside."

Regarding the outbreak in the Akyab jail, it appears that the first case was that of a free warder who lived in a quarter of the town where the disease was prevailing severely at the time. He was attacked with cholera in a severe form on the 30th May, "very suddenly, whilst on duty amongst the prisoners in the jail, from which he was speedily removed." He died the same evening. The disease commenced among the prisoners on the 3d June, and continued until the first week in July, during which time it caused 57 admissions and 32 deaths. The one fault in the sanitary condition of the jail was "bad drainage;" whilst the general health of the majority of the prisoners "was anything but good, a very large proportion of them being opium-eaters, debilitated by excess and sudden deprivation of their accustomed stimulant, than whom there is no class more open to attacks of certain diseases, especially cholera, diarrhœa, and dysentery; and, as might be expected, all the first victims came from the part of the jail set apart for reconvicted prisoners, all of whom were opium-eaters." It is stated that the water used for drinking "was not at fault," and was pronounced, on chemical analysis, "to be fairly good."

Regarding the outbreak of cholera in the Kyoukphyou jail, it is stated that "the jail and neighbourhood of Kyoukphyou had been quite free from cholera; but on the 25th June a man, a traveller passing through from Ramree, was reported to be lying ill of cholera in a rest-house in the town." He was removed by the civil surgeon to an outhouse of the civil hospital, close to the jail, where he died on the following day, 26th June. "Whilst ill his evacuations were thrown on the sandy bank of a stream which runs through the workyard grounds of the jail, and close to the civil hospital; and after his death his clothes were burnt on the bank of the stream. The drinking-water of the jail is drawn from a well in the workyard enclosure, and the hospital attendants had access to this well also." On the 28th June the disease attacked the prisoners in an intensified form—10 out of 110 in the jail were attacked, all of whom died; on the 29th 13 were attacked, of whom 9 died; on the 30th 9 were attacked, of whom 3 died. "The disease continuing to attack one or two prisoners at intervals, all those in jail were moved into the schoolhouse, which was formerly the jail hospital, on 9th July, after which the disease ceased."

Regarding the sanitary condition of the jail, it is stated that "the floors of the wards were old and low, and could not be cleaned out beneath." It is recorded, also, that "amongst the prisoners who died on the second day of the outbreak was a man who, being under sentence of death, was confined strictly to a cell inside the jail walls; he had water to drink from the well referred to, and had, of course, no access to the stream."

1879.—In this year, the second of the cycle, there was a very marked abatement in the prevalence of cholera. Among the civil population the death-rate sank to 0.59 per mille of population in 1879 against 2.28 in 1878. This general abatement of cholera activity, which was normally due in the periodic course of the disease in this year of the cycle, was coincident with a rainfall somewhat above the average following upon a year of unpre-

cedented drought. The rainfall of 1879 exceeded that of 1878 by about 29 inches (see Table No. V.)

Comparing the monthly district returns for 1879 with the corresponding statements for the preceding year, the figures show that the cholera of 1878, which revived in activity in October, and reaching its climax in the following month, was again on the decline in December, though still in considerable activity at the close of that year in each of the three divisions of the province, but mainly so in Pegu, was continued into the early part of 1879 on a progressively declining scale until the month of March; that after March the disease remained at a stationary rate of prevalence, varied only by unimportant fluctuations, until the month of August, when a further decline took place until the month of December, in which the disease again commenced a renewal of activity, with which the year closed.

The year 1878 closed with cholera more or less active during December in every district of the province, excepting Kyoukphyou and Sandoway in Arakan, and Tavoy in Tenasserim. The year 1879 opened with the disease more or less active during January in every district of the province, excepting Sandoway and Toungoo, and of these the latter remained exempt throughout the year, whilst the former was not affected until October. During January the cholera of 1879 was principally active in the Pegu and Tenasserim divisions, and the mortality of the month was 445 against 581 deaths registered in the preceding month. Of this number, 143 deaths were contributed by the Tenasserim districts, and all the remainder, except 5 in Arakan, by the Pegu districts.

In Tenasserim the cholera of 1878, which had been persistently, but not severely, prevalent throughout the last nine months of the year in Toungoo district, finally ceased there with the close of that year, and there was no reappearance of the disease in this district throughout 1879. In Shwegyin, where cholera suddenly flared up into increased activity in the preceding month, there was a sudden and great fall in the mortality of January; and this continued until the disease finally ceased in March, no other deaths, excepting 2 in May and 1 in June, being recorded during the rest of the year. In Moulmain, where, after an absence of three months, cholera reappeared with 4 deaths in December 1878, the disease caused 20 deaths registered in January 1879, and then suddenly subsided, only a single death appearing in February, 3 in April, and 2 in May, and then no more until December, when again 2 deaths were registered. In Tavoy, where no cholera death had been recorded since February in the preceding year, the disease seems to have burst out suddenly with 42 deaths in January and 24 in February, and then to have finally ceased, no other record of cholera in this district appearing during the rest of the year. In Mergui, where, after a complete absence since the preceding January, cholera appeared with only 2 deaths in December 1878, the disease broke out in epidemic activity in January 1879, with 68 deaths registered in that month. In February the outbreak culminated with 136 deaths, and then, progressively declining, finally ceased with 4 deaths in May, no other record of the disease in this district occurring during the rest of the year.

In the Pegu districts the cholera brought over from the preceding year finally subsided by the end of February in Tharawadi, Henzada, Prome, and Thyetmyo, only an occasional solitary death being recorded in them during the months from April to June; but in Rangoon, Thonegwa, and Bassein the disease continued more or less persistently prevalent until the month of June, when it finally ceased in all of them. In July a fresh outbreak of

cholera occurred in Thyetmyo, with 141 deaths registered. Previous to this, and subsequent to the 3 deaths recorded in January, the only cholera mortality registered in this district comprised 1 death in April, 5 in May, and 1 in June. The sudden outbreak in July began to subside in August, the deaths in that month falling to 47, and finally ceased with 5 deaths in September, a solitary death in November being the only later record of cholera in this district during the rest of the year. In Prome during the same month of July a single death was recorded; it was followed by 6 others in August, and by 40 in September; the outbreak then subsided, and finally ceased with 4 deaths in October. In Henzada cholera reappeared also in July, with 3 deaths; these were followed by 7 in August, and the disease then disappeared. There was no reappearance of cholera at this time in the other Pegu districts, but in December the disease reappeared in Thonegwa, with 29 deaths registered; whilst solitary deaths were reported in Rangoon, one each in the months of September, November, and December.

In Arakan the cholera of 1879 was persistent throughout the year, but nowhere in epidemic form. The disease, which started into fresh activity in Akyab with 58 deaths in December 1878, suddenly subsided with only 3 deaths in January 1879, and none in February; in March, however, 6 deaths were registered, and in April the number amounted to 23 more, and again to 28 in May; in June the climax for the year, 45 deaths, was attained; and thereafter abating with alternate fluctuations, the disease persisted till the close of the year, with 28 deaths in December. In Kyoukphyou, after a lull in the preceding December, cholera recommenced activity with 2 deaths in January; these were followed by 27 in February, and by only 6 in March; in April the number rose again to 42, and in May to 51, the climax of the year; there was then a decline, and the disease finally ceased with 3 deaths in October. As cholera ceased in Kyoukphyou, it made its appearance for the first time in this year in Sandoway, with a single death recorded in October and 10 in November, and then suddenly ceased.

The cholera of 1879 in this province is thus shown to have been very differently active in the different parts of the country. In Arakan it was more or less sporadically prevalent throughout the year; in Tenasserim it prevailed as a mild epidemic, and finally ceased by the end of May; but in Pegu the disease presented a succession of outbursts of activity. Thus the cholera brought over from the preceding year ceased activity in the inland districts in February, but in the maritime districts not till June; in July there was a revival of activity in the inland districts, which ceased in October; and, lastly, there was another revival of activity in the maritime districts—of Thonegwa and Rangoon—in December.

Regarding the prevalence of the cholera of 1879 in the principal towns, the following details are recorded:—

Akyab .	Pop.	21,046	Deaths	15	First on	9th April	Last on 31st Dec.
Rangoon .	„	91,579	„	21	„	10th Jan.	„ 27th Dec.
Yandoon .	„	8,937	„	39	„	13th Jan.	„ 31st Dec.
Pantanau .	„	6,020	„	22	„	7th Jan.	„ 28th Feb.
Bassein .	„	21,984	„	9	„	8th Jan.	„ 17th June.
Zayoon .	„	5,304	„	5	„	13th Feb.	„ 20th Feb.
Kyanghin .	„	8,495	„	3	„	1st Aug.	„ 3d Aug.
Prome .	„	31,157	„	24	„	9th Jan.	„ 12th Oct.
Shwedoung	„	5,323	„	4	„	7th Jan.	„ 17th Sept.
Thyetmyo .	„	9,999	„	70	„	5th July	„ 8th Aug.
Allanmyo .	„	6,841	„	9	„	26th March	„ 29th Sept.
Moulmain .	„	54,870	„	8	„	8th Jan.	„ 17th May.
Tavoy .	„	14,823	„	6	„	26th Jan.	„ 31st Jan.
Mergui .	„	11,416	„	66	„	1st Jan.	„ 26th March

The towns of Henzada, Myanoung, Shwegyin, and Toungoo recorded no cholera throughout the year.

The following particulars are furnished in "An Extract from the Sanitary Report in answer to the Questions on this subject by the Medical Officer of the 43d Regiment":—

"Cholera occurred involving both European and Native community. The first case was that of the farrier-sergeant of the Royal Artillery on the 22d June. The disease continued unchecked up to the 4th August, after which no case occurred up to the 22d September, on which date two Europeans were attacked, and none afterwards. Two deaths of a suspicious nature occurred among the European troops at Allawayo in June; one was afterwards returned as cholera. The farrier-sergeant of the Royal Artillery was at Allawayo in June, and saw the corpse of one of the men who died. The troops at Allawayo were prohibited from visiting the town at the time. A few cases of cholera occurred among the natives. The two cases above mentioned are the only ones which occurred among the European troops at Allawayo."

Regarding the prices of food and meteorology at Thyetmyo, it is recorded as follows:—"Season unfavourable to health. Excessive heat in March, April, and May was followed by great variations of temperature and excessive dampness of the monsoon; 40 inches of rain fell against an average of 36 inches."

In the suggestions for sanitary improvements it is recommended that "the ground near the Royal Artillery barracks, which becomes a swamp during the rains, should be drained, and all jungle cleared as much as possible."

Regarding the drainage of the station, it is stated—"Surface drainage good, but to the north of the Artillery barracks several acres of ground become swampy during the rains."

At the time of this outbreak among the troops cholera was also very prevalent in the Native town of Thyetmyo, 70 deaths having been registered from the 5th July to the 8th August in a population of 9999; the disease was also epidemic in the district, and indeed in the Pegu division generally. The total cholera mortality of the year registered in the several districts is shown in Table No. I.

1880.—The abatement of cholera activity which had marked the preceding year was steadily maintained throughout the year 1880, as was normally due for this the third year of the cycle. Among the troops and jails the death-rate from the disease for 1880 was 0.61 per mille of strength against 3.89 in 1879; whilst among the civil population it was 0.85 per mille of population against 0.59 respectively (see Table No. V.) This continued abeyance of cholera activity in 1880 was coincident with a year of rainfall varying but little in amount from that of the preceding year, and exceeding the average fall by only a few inches.

Comparing the monthly district returns of cholera mortality for 1880 with the corresponding statements for the preceding year, the figures show that the cholera of 1879, which was persistent at the close of that year in the Akyab district of Arakan, and had reappeared in epidemic activity in the Thonegwa district of Pegu, was continued in those districts during the early months of 1880 with a more or less marked tendency to diffusion within their limits, and that it finally ceased entirely in Arakan by the beginning of May, and in Pegu by that of July. The Tenasserim division,

with the exception of 5 deaths recorded in January and 4 in February in Moulmain district, in continuation of the reappearance of the disease there with 2 deaths in the preceding December, remained during this period and until October following completely free of the disease.

In Arakan the cholera, which had continued on from the preceding year in Akyab district, acquired increased force in January 1880, and reappeared also in Kyoukphyou district, where during the two preceding months there had been no record of the presence of the disease. In February cholera abated considerably in Akyab, and ceased in Kyoukphyou with 2 deaths only registered in that month, and no more during the rest of the year. During March and April cholera subsided in Akyab also, a single and the last death of the year here from this cause being recorded on the 3d May. The total cholera mortality of the year registered in Arakan amounted to 116 deaths in Akyab, viz., 4 in the Akyab town, and 112 in 13 out of the 1945 villages of the district, and 10 in Kyoukphyou, all in 2 villages out of the 986 in the district; the Sandoway district recording no cholera throughout the year.

In Pegu the cholera which had, after an absence of five months, reappeared in epidemic force in the Thonegwa district in December 1879, and had also manifested its presence in Rangoon by single deaths registered in that district during November and December of the same year, continued with increasing activity in those districts during January 1880, and appeared also in the Henzada and Bassein districts, in which there had been no record of the presence of the disease during the preceding six and four months respectively. In the area covered by these four districts (the three other Pegu districts showing no sign of the presence of the disease) cholera ran a mild epidemic course, with varying prevalence in the different districts, until April, when the disease commenced to abate; in February it had ceased in Henzada, in March in Rangoon, and in April in Bassein; but in Thonegwa it lingered on until July, in which month a single death registered marked the final cessation of the cholera brought over from the preceding year in this division. Whilst this cholera was subsiding to final cessation in July in the area primarily affected, a few scattered deaths appeared in the other previously unaffected districts of Pegu; thus in April, as the disease was subsiding in Bassein and Thonegwa, it appeared for the first time in Tharawadi, and causing 12 deaths in that month, finally disappeared; in Rangoon, after an interval of two months, cholera reappeared with 3 deaths in June and 1 in July, and then no more during the next two months; in Prome there is no record of cholera until June, in which month a single death was registered, and none again in the following month; in Thyetmyo the first cholera of the year is recorded in July, with 2 deaths in that month, and none again in the following month. And thus the cholera which commenced its course of revived activity in December of the preceding year in the Thonegwa and Rangoon districts of Pegu is shown to have run its course in that division, and to have finally ceased in July 1880.

In Tenasserim, with the exception of the few deaths recorded in January and February in continuation of the reappearance of the disease in Moulmain district in the preceding December, as before mentioned, there is no record of the presence of cholera anywhere until the month of October.

This completes our tracing of the cholera of 1880 in this province so far as concerns the outbreak which was continued over from the preceding year. The records show that it ceased in Tenasserim in February and in Arakan early in May, but in Pegu lingered on until July, when it finally ceased in

that division also. The total cholera mortality registered in the Pegu division during July amounted to only 4 deaths.

In August no cholera was recorded anywhere in the province, excepting only a single death in the Prome district. This death marks the commencement of a new epidemic outbreak, which constituted the main cholera of 1880 in this province, and which was almost exclusively confined to the Pegu division, the only other part of the province affected by it in this year being the Shwegyin district of Tenasserim, although before the close of the year the appearance of the disease was announced in Moulmain district also.

I now proceed to trace the course of this newly commenced cholera epidemic of 1880 in the British Burma Province from the data afforded by the district monthly mortality returns.

In the Prome district, prior to the occurrence of the single death registered from the disease in August 1880, there had been no record of the presence of cholera since the preceding October, with the exception only of a single death registered in June 1880. In this latter month the total number of cholera deaths registered in the whole province amounted to 7 only, and they all occurred in the Pegu division, viz., 3 in Rangoon, 2 in Thonegwa, and 1 in Bassein, all three contiguous maritime districts, and 1 in Prome, the most inland and northerly of all the districts of Pegu, excepting only Thyetmyo. In July the total of cholera deaths registered in the whole province was only 4, and they also all occurred in the Pegu division, viz., 1 in Rangoon, 1 in Thonegwa, and 2 in Thyetmyo, the most inland and northerly of all the Pegu districts. In August only a single death from cholera was registered in the whole province, viz., that in Prome already referred to; it was the second cholera death registered in this district since the preceding October, the first having been registered in June, or at an interval of at least a clear month before the second; but in this interval 2 deaths from cholera had been registered in the adjoining district of Thyetmyo. In September a total of 90 cholera deaths was registered in the whole province, and they all occurred in the Prome district, excepting only 1 in the adjoining Thyetmyo district. This mortality marks the start of the outbreak, which presently burst into epidemic violence and overspread the whole division.

In October, while rapidly progressing in Prome and Thyetmyo, cholera broke out with more or less violence in all the other Pegu districts, and appeared also, with a single death registered, in the Shwegyin district of Tenasserim, situated in the valley of the Sittang River, as are the districts of Pegu in the valley of the Irrawaddy River, the two river-valleys being separated by the Pegu Yoma range of hills; the total number of cholera deaths registered in this month amounted to 602, of which number 399 occurred in the Prome district alone. In November, without appearing in any fresh area, the epidemic attained its climax, represented by 887 deaths registered, of which 359 were contributed by Prome, 182 by Tharawadi, and 104 by Thonegwa. In December the epidemic continued active, but in declining force in all the previously affected districts, and appeared also in the Moulmain district with 2 deaths registered; the total mortality of the month fell to 634 deaths, of which only 94 occurred in Prome, whilst Thonegwa contributed 160, Rangoon 111, and Tharawadi 102. In Henzada and Thyetmyo the disease had almost ceased, but in Bassein was still actively increasing, as also in Shwegyin. The Arakan division remained free of the disease throughout this outbreak, which, commencing in the north of Pegu, advanced steadily southward and eastward into Tenasserim, the farthest point southward which was reached when the year closed being the Moulmain district, in which the disease appeared on the 19th December.

Of the total cholera mortality of the year—2638 deaths—420 were caused by the subsiding cholera continued over from the preceding year, and 2218 by the new epidemic of the year 1880, the first commencement of which was marked by a single death registered in Prome in the month of June, followed by 2 in Thyetmyo in July, and another single death in Prome in August. These stray deaths stand out in the returns as the forerunners of the approaching epidemic which burst out in Prome in September and in Thyetmyo in October.

We thus find that the cholera of 1880 in this province is shown by the returns to have consisted of two distinct epidemic outbreaks, which are clearly separated from each other by a four months' interval of minimum prevalence of the disease (see Table No. II.) The first was a continuation of the revived outbreak of the preceding year's autumnal cholera, which took place in December 1879, in the Akyab district of Arakan, the Rangoon and Thonegwa districts of Pegu, and the Moulmain district of Tenasserim—all maritime districts—and which, without any very extended diffusion into fresh areas, subsided in April, and finally ceased altogether in July, with a single death recorded in each of the districts of Rangoon and Thonegwa. This outbreak commenced with 60 deaths registered in December 1879, culminated with 163 in January 1880, and thereafter progressively abating with 116 deaths in February and 91 in March, subsided with 37 in April; after this a few scattered cases only appeared here and there, with 5 deaths in May and 6 in June, until the epidemic finally ceased with 2 deaths in July.

The second was a new epidemic of cholera, which, commencing with one or two deaths during June, July, and August in the two most inland and northerly districts of Pegu, suddenly burst into epidemic activity in one of them—Prome—in September, and during the following month overspread every district of the division, and extended also into the Shwegyin district of Tenasserim. This outbreak, commencing activity in September with 91 deaths registered, rapidly progressed, with 602 deaths in October, to its climax, attained in November, with 887 deaths, and then commenced to abate, the year closing with 634 deaths registered in December.

There was an outbreak of cholera in the Thyetmyo jail, strength 404, with 16 admissions and 5 deaths. This outbreak, it is stated, commenced on the 22d and ended on the 27th September. The medical officer, in his report, writes—"There was not a single case of cholera in Thyetmyo at the time, and the first prisoners who were attacked had recently arrived from Prome, where the disease prevailed;" and, adds the Inspector-General of Prisons—"There can be no question that it was imported." The mortuary returns for the province, however, show that the outbreak in this jail was only a part of the general epidemic of cholera, which, having burst out in Prome district in September, overspread every district in the Pegu division in the following month.

1881.—In this year cholera prevailed with marked increase of epidemic activity. The death-rate of the year rose to 4.04 per mille of strength among the troops and jails, and to 1.77 per mille of population among the civil population, from 0.61 and 0.85 respectively in the preceding year. This revived activity of cholera in 1881 came seasonably in the normal course of the observed periodicity of the disease, and was due in this the first year of a new triennial cycle. It was coincident with a very abundant rainfall which followed upon a year of more than average rainfall; the rainfall of 1881 exceeded that of 1880 by about $4\frac{1}{2}$ inches, that of 1880 itself being about $3\frac{3}{4}$ inches above the average.

From the district monthly mortality returns it appears that the cholera epidemic which commenced in September 1880 at Prome, and during the following month overspread the whole area of the Pegu division, and also affected the Shwegyin district in Tenasserim, had reached its climax in November, and commencing to abate in December, passed on at a continuously declining rate into January 1881, and during the next two months subsided to a minimum spring prevalence; that the disease, which made its appearance in Moulmain district with 2 deaths registered in the preceding month, had in January 1881 caused a mortality there of 36 deaths, and gradually acquiring increased epidemic force during the succeeding months, reached its climax in May, and, thereafter subsiding, finally ceased in September. With this exception, no fresh district was epidemically affected by the disease, though a few deaths were registered from it in Akyab, in the north of the Bay shore, and Tavoy, in its south. In March, as already mentioned, the cholera of the preceding autumnal revival had sunk to its minimum of spring prevalence. In April there occurred a revival of activity in the area previously affected, and the mortality of the month more than doubled that of the preceding. This recrudescence of the disease marks the commencement of the epidemic cholera of 1881. During May the disease continued to advance, but at a declining rate; and in June it received a decided check, the mortality of the month being nearly a sixth less than that of the preceding. In July, however, there occurred a sudden outburst of renewed activity, and the mortality of the month exceeded that of the preceding by five times. This activity was continued at a somewhat increased rate during August; but in September there occurred a very sudden and marked abatement, the mortality falling to about one-eighth that of the preceding month. In October it fell still lower (see Table No. II.), and during November remained at much the same level, but with a sensible tendency towards renewed activity; this became more pronounced in the following month, and the year closed with a mortality in December exceeding that of the preceding month by nearly four and a half times. This autumnal revival of cholera was confined to the Pegu division, every district of which was affected; a few deaths also were recorded in the northern districts of Tenasserim and in the Akyab district of Arakan. With the exception of a few stray deaths during January, June, and December in Akyab district, the Arakan division enjoyed a marked immunity from cholera throughout the year.

In connection with an epidemic outbreak of cholera at Dala, in Rangoon, during October, it is recorded, with reference to the influence of neglected sanitation on the health of the adjacent population, that, apart from foul wells and tanks and streams, the injurious effect of the "retention of house-refuse and every abomination in the way of filth close, and indeed sometimes underneath their dwellings," overpowers that of all others. The condition of that part of Dala occupied by the poorer classes is illustrated by the following description:—"In one group of houses, when cholera prevailed, the water was got from a filthy tank and a dirty stream close by. The waste water is thrown in front of the house, or oftener through the bamboo flooring of their huts to the ground beneath. A fluid several inches deep accumulates; into this are thrown all sorts of house-refuse, possibly sometimes excreta and urine, with which is at length formed a semi-fluid mass of putrefying animal and vegetable matters disgusting in appearance and giving off a most offensive smell."

In contrast with this is the occurrence of a sudden outbreak of cholera in the Rangoon Lunatic Asylum, the first case being admitted on the 18th

November and the last on the 1st December. The lunatic asylum is described as "one of the best-cared-for institutions in Rangoon, . . . is kept scrupulously clean, the latrines are in the most perfect order, and the inmates kept in seclusion from the outer world; and yet here cholera suddenly makes its appearance, and as suddenly ceases."

There was a somewhat sharp outbreak of cholera in Henzada jail, 109 in strength, with 14 admissions and 9 deaths.

Regarding the outbreak in Moulmain jail the following particulars are recorded:—It is stated that the first case occurred during the night of the 13th–14th January, and the patient died on the forenoon of the following day; he had been in the jail for about twenty-two months. On the morning of the 16th January 4 more were attacked; they came from three wards—that from which the first case came being a fourth affected; by the evening 6 other cases were admitted. Of these 11 cases only 2 ultimately recovered. The shortest period that any of them had spent in jail was over seven months. By the evening of the 19th January 17 fresh cases had occurred, and on the 20th a party of 150 convicts was moved to Kyouktan. The disease continuing, on the 26th another 250 were moved to the coalshed; and then the epidemic received a check, only 1 case occurring in the next seventeen days to the 12th February. On the 9th February the prisoners were brought back to the jail, and on the 12th an insane, who had long been in hospital, was seized. During the three following days 6 more prisoners were attacked, of whom all but 1 ultimately died. On the 15th Kyouktan was reoccupied, and the coalshed on the 21st, and between these dates 5 more prisoners were attacked, and the last on the 3d March. The prisoners from Kyouktan and the coalshed were again brought back to the main jail on the 11th and 14th March respectively. In this epidemic every ward and the hospital were affected, excepting the under-trial ward, containing 29 persons, and the European ward, containing 29 European prisoners, which both remained free of the disease throughout. Of the wards, No. 2, on the basement, and in which the first case appeared, and No. 8, affected next morning, on the upper storey, returned the highest percentage of attacks to strength of inmates, viz., 19.23 and 21.15 respectively. The hospital returned a percentage of 11.45 attacks. No. 3 ward, on the basement, and No. 4, on the upper storey, both affected on the second day of the outbreak, returned a percentage of 13.46 and 11.45 attacks respectively.

Summary Review.—From the preceding account of the history of cholera in the British Burma Province, one of the most remarkable features disclosed by the recorded statistics of the prevalence of the disease is the limitation of its epidemic activity to different divisions of the province in successive years, as is shown for the first nine years of our series in Table No. II., and for the subsequent years in the annual historical accounts, the last of which we have just concluded. It would be interesting to ascertain whether it is the peculiar physical conformation of the country which operates to bring about this result, or whether it is due rather to influences of climate modified in the seasonal recurrence of meteorological phenomena by the geographical position and physical aspects of the province. But whatever the cause may be, one result of this limited activity of epidemic cholera in British Burma is to obliterate to a great extent the traces of its periodical cyclical recurrence which have been observed to obtain in the other provinces of India. For instance, a new epidemic cholera commencing in the normal course of its cycle for a three years' career, instead of covering the whole province at maximum intensity in the first year, abating in the second, and

ceasing in the third, usually confines its intensity to only one division in the first year of its cycle, and, extending into a fresh area in the second, there commences a fresh epidemic activity, to be repeated again in the third year in a new area, or else subsiding in a previously affected area, to be mixed up with the commencement there of a new epidemic cholera of the next triennial cycle. The consequence is, that the regular cyclical periodicity of cholera prevalence in this province is not so clearly traceable as it is in most other parts of India. Nevertheless the statistics of cholera mortality in British Burma, so far as they go, do show unmistakable signs of the existence of the same cyclical periodicity of cholera prevalence as that which has been so often referred to in previous passages.

Turning to Table No. V., if we examine the death-rates in the column for troops and jails, and in that for the civil population, we find that in the first triennial cycle, 1863–65, the imperfect data indicate the commencement of a new epidemic cholera in its first year, as due in the normal course of the periodicity of the disease; in the second year, making allowance for the additional jail mortality, we may conclude that there was a general abatement in the prevalence of cholera, as normally due for this year of the cycle; in the third year, however, the disease, instead of subsiding, as due in the normal course, is shown to have prevailed with greatly increased severity. This irregularity, it appears, was caused by the new epidemic cholera of the next succeeding triennial cycle having started into activity some months earlier than it was due, viz., in the last quarter of 1865, instead of in the first quarter of 1866.

In the second triennial cycle of our series, 1866–68, both for the troops and jails and for the civil population (so far as available for the latter), the death-rates show the prevalence of cholera to have been in the normal course for the successive years of the cycle, viz., maximum activity in the first year, abated activity in the second, and subsidence to minimum prevalence in the third.

In the third triennial cycle, 1869–71, again, the prevalence of cholera was in the normal course for the successive years of the cycle, making allowance for the exceptional mortality among a group of the European troops; thus the first year of the cycle was one of new epidemic cholera activity, the second of abatement, and the third of complete subsidence.

In the fourth triennial cycle, 1872–74, cholera again pursued its normal periodic cyclical course, but with a marked irregularity in the second year. The new epidemic commenced as due in the first year of the cycle, but did not attain its intensity until the second year; in the third year, however, the disease subsided into abeyance or minimum prevalence.

In the fifth triennial cycle, 1875–77, the normal periodicity of cholera prevalence was apparently thrown out of the due course by the irregularity which occurred in the preceding cycle. In the first year of this cycle the new epidemic cholera, which was due in the normal course, did not start into activity till quite the close of the year; its intensity, in consequence, was transferred to the second year of the cycle, whilst the first continued to show the abeyance of the disease which marked the last year of the preceding cycle. The new cholera epidemic of the cycle 1875–77, commencing later than due, as shown, was prolonged into the third year of the cycle, and in that year becoming continuous with the new epidemic cholera of the next succeeding cycle, which commenced activity some months before it was normally due, viz., in the last quarter of 1877, instead of the first quarter of 1878, raised the mortality of the third year of the cycle to a maximum

figure, and, in fact, thus reversed the usual order of sequence in the annual prevalence of the disease in this cycle.

In the sixth and last triennial cycle of our series, 1878–80, however, cholera again resumed its normal periodic course, viz., maximum prevalence in the first year of the cycle, abatement in the second, and subsidence in the third. Of the next triennial cycle, 1881–83, only the first year is included in the series of twenty with which this history deals. But for that year, 1881, the statistics show that a new epidemic cholera had started into activity, as was normally due for that year of the cycle.

With regard to the influence of rainfall upon the prevalence of cholera, statistics are available only for the years commencing with 1869. A comparison of the amount of rainfall with the amount of cholera prevalence in each year of those for which the data are available does not at first sight suggest the existence of any fixed relation between them as cause and effect. The periodicity of cholera prevalence, it appears, is quite independent of rainfall; but the intensity of that prevalence, it appears, is certainly influenced by it; not so much by the mere amount of rainfall as by the conditions preceding, attending, and following it. For instance, taking the data at our disposal; in 1869 we find a new epidemic cholera commencing in the normal course with the first year of a triennial cycle, the rainfall of the year being somewhat above the average. In the second year we find an abatement of the disease, with the rainfall of the year slightly below the average, that is, without much disturbance in the meteorological elements of the two years, so far as dependent on rainfall. In the third year of the cycle we find cholera subsided into abeyance, with the rainfall of the year exceptionally high above the average, and that in succession to a year of but little less than average rainfall, which indicates supersaturation of the soil and air with moisture, and evaporation with sudden changes of temperature and humidity of the air at a minimum.

In the next cycle, 1872–74, we find a new epidemic cholera starting into activity, as normally due, in the first year, with the rainfall of that year considerably below the average, and so greatly less than that of the preceding year as to constitute a season of absolute drought. In the second year this drought is still severe, though the rainfall is some inches in excess of the preceding year's fall, and suffices to produce rapid evaporation and sudden changes of temperature and humidity of the air; and with these conditions we find an increased activity of cholera out of the normal course. In the third year the drought is still more intense, and following upon an already parched soil, is attended with little evaporation and disturbance in the temperature and humidity of the air; and with these conditions cholera, in the normal course for this year of the cycle, prevails with minimum force.

In the next cycle, 1875–77, the rainfall of the first year is excessively greater than that of the preceding year, and also greatly above the average, thus supersaturating the soil and reducing evaporation and changes of temperature and humidity to a minimum; with these conditions we find cholera still in abeyance, and the new epidemic activity normally due in this year retarded till its very close. In the second year of the cycle the rainfall is excessively in defect, producing absolute drought, and this following upon a year of excessive rainfall favours rapid evaporation and sudden changes of temperature and humidity; and with these conditions we find the retarded cholera starting into epidemic activity. In the third year of the cycle the rainfall is again excessively greater than that of the preceding year, and also much above the average; but falling upon a parched soil, it produces active

evaporation and sudden and great changes in temperature and humidity; and with these conditions we find cholera altogether abnormally and unseasonably prevalent.

In the cycle 1878-80 the rainfall of the first year is exceptionally deficient, and this drought following upon a year of very abundant rainfall, favours the continuation of active evaporation and sudden changes in temperature and humidity; and with these conditions we find a new epidemic cholera, starting into activity in its normal course, prevailing with more than ordinary intensity. In the second year of the cycle the rainfall, though little above the average, was excessively greater than that of the preceding year; and falling upon a parched soil favoured evaporation and its attendant changes of temperature and humidity, though probably in a less degree than in the previous years noted; with these conditions we find cholera greatly abated and in course of subsidence, as normally due in this year of the cycle. In the last year of the cycle the rainfall varied little in amount from that of the preceding year, and not much, also, from the average; with these conditions cholera, as normally due in this year, subsided into abeyance or minimum prevalence.

In 1881 the new epidemic cholera of the new cycle was coincident with an abundant rainfall, but not excessively greater than that of the year preceding.

From the above analysis of the data furnished by our statistics it appears that cholera is certainly influenced, in respect to the intensity of its prevalence, by the effects of rainfall acting through the soil upon the climatic conditions of the lower strata of the atmosphere in respect chiefly to temperature and humidity.

SECTION IX.

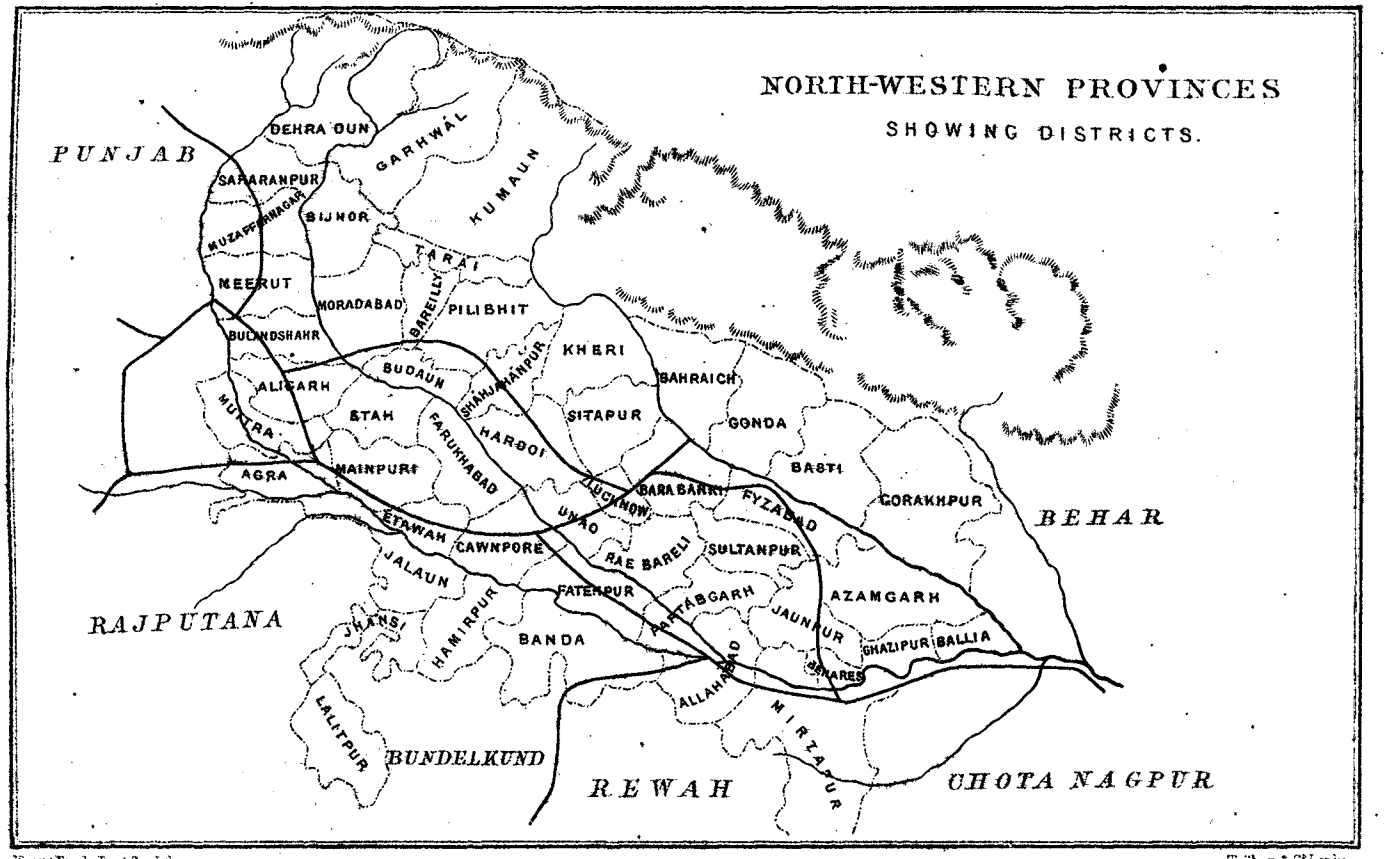
NORTH-WESTERN PROVINCES AND OUDH.

Geographical Position.

THE North-Western Provinces lie between 23° 51′ 30″ and 31° 5′ N. lat., and between 77° 3′ and 84° 43′ 30″ E. long., and are bounded on the north by Tibet, on the north-east by Nepal and Oudh, on the east by Bengal, on the south by Chota Nagpore, Rewah, Bandelkhand, and the Central Provinces, and on the west by Gwalior, Rajputana, and Panjab. The Oudh Province lies between 25° 34′ and 28° 42′ N. lat., and between 79° 44′ and 83° 9′ E. long., and is bounded on the north-east by Nepal, on the north-west by the Rohilkhand division, on the south-west by the River Ganges, on the east by Basti district, and on the south-east by Benares division. The divisions, districts, area, and population of the territory under British administration are shown in the annexed tabular statement. The Native States—Garhwál and Rampur—contain an area of 5125 square miles, with a population of 657,013 persons.

STATEMENT *showing Population, Area, and Density of Population in each District of the North-Western Provinces and Oudh for the Year* 1872.

Divisions.	Districts.	Population (Census 1872).			Grand Totals of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Kumaun.	Kumaun . .	231,146	201,742	432,888	928,817	6,000	12,420	72	109
	Garhwál . .	155,745	154,537	310,282		5,500		56	
	Tarái	102,573	83,074	185,647		920		201	
Rohilkhand.	Bijnor . . .	395,395	341,757	737,152	5,249,903	1,868	10,850	394	483
	Moradabad . .	596,776	525,355	1,122,131		2,281		492	
	Bareilly . . .	806,913	699,888	1,506,801		2,971		500	
	Sháhjahánpur .	511,136	438,335	949,471		1,744		544	
	Budaun . . .	503,619	430,729	934,348		1,986		470	
Sitapur.	Kheri . . .	428,288	362,744	791,032	2,784,950	2,360	6,866	331	405
	Sitapur . . .	530,567	466,828	997,395		2,214		450	
	Hardoi . . .	535,995	460,528	996,523		2,292		435	
Meerut.	Dehra Dun . .	68,044	47,667	115,711	4,973,190	1,192	11,300	97	414
	Saharanpur .	484,508	399,274	883,782		2,221		397	
	Muzaffarnagar	375,608	314,474	690,082		1,654		417	
	Meerut . . .	685,404	588,510	1,273,914		2,361		539	
	Bulandshahr .	493,682	442,911	936,593		1,918		488	
	Aligarh . . .	577,263	495,845	1,073,108		1,954		549	
Agra.	Etah	455,200	380,166	835,366	5,038,136	1,738	10,148	480	494
	Muttra . . .	393,854	335,726	729,580		1,452		502	
	Farukhabad .	499,722	419,026	918,748		1,718		534	
	Mainpuri . .	426,955	338,828	765,783		1,697		451	
	Agra	603,869	516,209	1,120,078		1,845		607	
	Etawah . . .	369,928	298,653	668,581		1,698		393	



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Continuation of Statement showing the Population, Area, and Density of Population in each District of the North-Western Provinces and Oudh for the Year 1872.

Divisions.	Districts.	Population (Census 1872). Males.	Females.	Total.	Grand Totals of Divisions.	Area in square miles. District.	Division.	Population per square mile. District.	Division.
Lucknow.	Lucknow	437,027	390,310	827,337	3,032,370	966	4,480	856	703
	Bara Banki	612,940	580,155	1,193,095		1,768		675	
	Unao	517,865	494,673	1,011,938		1,746		580	
Allahabad.	Cawnpore	619,118	536,321	1,155,439	5,466,116	2,336	13,615	495	419
	Fatehpur	345,533	318,282	663,815		1,637		405	
	Jaunpur	545,700	480,169	1,025,869		1,554		660	
	Hamirpur	276,196	252,941	529,137		2,288		231	
	Banda	359,765	337,846	697,611		2,960		235	
	Allahabad	715,110	679,135	1,394,245		2,840		490	
Rae Bareli.	Rae Bareli	527,547	530,294	1,057,841	2,967,203	1,747	4,898	605	604
	Sultanpur	542,804	527,556	1,070,360		1,706		627	
	Partabgarh	428,650	410,352	839,002		1,445		581	
Fyzabad.	Bahraich	435,292	393,355	828,647	3,171,162	2,409	6,756	344	487
	Gonda	645,039	603,086	1,248,125		2,661		469	
	Fyzabad	560,452	533,938	1,094,390		1,686		649	
Benares.	Gorakhpur	1,078,072	941,278	2,019,350	8,178,147	5,484	18,326	440	562
	Basti	784,691	688,303	1,472,994		2,787		724	
	Azamgarh	767,175	604,233	1,311,408		2,147		610	
	Ghazipur	815,542	749,861	1,565,403		2,587		599	
	Benares	406,344	387,355	793,699		997		796	
	Mirzapur	520,496	494,797	1,015,293		5,224		194	
Jhánsi.	Jalaun	216,607	187,777	404,384	934,747	1,562	5,075	258	189
	Jhánsi	167,519	150,216	317,735		1,566		202	
	Lalitpur	111,625	101,003	212,628		1,947		109	
Total of the provinces		22,609,299	20,115,442	42,724,741		104,734		407	

NOTE.—The district of Bareilly includes Pilibhit, and that of Ghazipur includes Ballia.

Physical Aspects.

The North-Western Provinces and the province of Oudh together include the whole of the wide Gangetic basin from the Panjab plain and Himalayas to the Vindhyan plateau and the low-lying rice-fields of Bengal, the Oudh Province occupying the large semicircular tract comprised in the valleys of the Gogra and the Gumti, and intervening between the Rohilkhand and Benares divisions. The provinces, taken as a whole, consist of the richest wheat-bearing country in India. Irrigation is free, both naturally by the numerous rivers which issue from the northern mountains, and artificially by a "magnificent system of canals and distributaries, which owe their origin to British enterprise." The general surface presents a very monotonous alluvial plain, only merging into hilly or mountainous country at the extreme edges of the basin on the south and north. The country slopes from every side to the main stream of the Ganges in its course to the Bay of Bengal—from the Himalayas, the Rajputana uplands, and the Vindhyan

plateau—and its alluvial soil is cut into deep channels by the numerous great rivers flowing down from the ring of heights on every quarter. The two principal rivers are the Jumna and Ganges, which unite at Allahabad. The country enclosed between contains some of the most populous and fertile districts in the North-Western Provinces, and is covered with a great ramification of irrigation canals, originally derived from the rivers on either side. These rivers flow through low-lying valleys, which are fertilised by their overflow or percolation. North of the Ganges, and closed in between that river and the Kumaun and Garhwál Hills and Oudh, lies the plain of Rohilkhand. It presents the general level features of the Gangetic valley, only slightly varied by the Tarái tract at the foot of the hills. South of the Jamna the Bandelkhand country slopes up from the river-bank to the edge of the Vindhyan plateau. It is a poor and irregular region, with a rocky and unfertile soil; it is intersected by Native States, and the population is impoverished, scanty, and ignorant. The northern portion near the Jumna approximates in the character of its soil to the interfluvial plain of the opposite Doab, but the southern portion is much cut up by sandstone and granite hills, emanating from the Vindhyan range. Below Allahabad the country approximates in appearance to the plains of Bengal, and in its northern part stretches across Oudh to the foot of the Nepal Himalayas. To the westward, south of the Ganges, the general features of the country somewhat resemble those of Bandelkhand; but the lowlands along the river-bank are more fertile, while the hill country is more mountainous and of greater extent. The principal rivers in these provinces are the Ganges, the Jumna, the Gogra, the Gumti, the Chambal, the Betwa, the Rapti, the Ramganga, &c., all of which drain directly or indirectly into the Ganges.

Climate.

The climate varies in the different parts of these provinces. Generally speaking the northern portions may be considered as hot and dry, and the southern, towards Benares and Bandelkhand, as more oppressive and somewhat moist. In Oudh the climate assimilates to that of Lower Bengal, but is less damp, though the heat is most oppressive in the rainy season. The year naturally comprises three seasons—the cold, from October to February or March; the hot, from March to June; and the rainy, from the middle of June to the beginning of October. The rainfall is very variable over the different divisions, being heaviest near the hills and lightest in the mid-plains.

Cholera History, Statistical and Descriptive.

The following series of tabular statements, Nos. I. to VI., exhibit the statistics of cholera mortality among the troops and jail populations, and, so far as available, among the civil population also, together with the rainfall records and price of the staple food-grain, for the twenty years 1862 to 1881 inclusive. The statements are in all respects uniform with the corresponding tables furnished with the history of cholera in the other provinces of British India.

No. I.—STATEMENT *showing the Annual Total Deaths Registered from Cholera among the Civil Population in each of the Districts of the North-Western Provinces and Oudh for the Years from* 1867 *to* 1881 *inclusive.*

Districts.	TOTAL CHOLERA DEATHS REGISTERED IN THE YEARS														
	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Kumaun . . .	165	2	54	5	7	26	2107	1	12	808	13	393	6894	5	68
Garhwál . . .	95	20	...	6	...	...	27	...	587	...	...	17	3473	...	659
Tarái	15	3	...	...	14	369	455	...	31	669	...	209	619	24	1
Bijnor. . . .	92	38	68	45	108	220	63	55	406	103	7	1300	588	14	10
Moradabad . .	3130	137	195	156	194	1131	703	64	794	582	18	375	151	971	25
Bareilly . . .	5913	531	935	197	139	1499	123	53	730	3111	33	1682	293	692	18
Shâhjahânpur .	7509	43	257	23	69	4403	60	19	1063	474	2	599	326	5738	10
Budaun . . .	701	103	1141	74	105	872	458	46	1741	94	22	81	330	160	158
Dehra Dun . .	198	10	1	4	3	250	...	1	368	...	...	...	636	2	3
Saharanpur . .	75	261	182	113	164	1351	45	17	504	17	3	12	960	1	9
Muzaffarnagar .	1077	152	166	160	95	35	5	2	561	8	2	33	295	1	130
Meerut . . .	912	318	565	118	84	510	53	5	1574	3	7	13	521	3	277
Bulandshahr .	467	78	155	57	41	419	43	27	2381	7	4	309	724	39	13
Aligarh . . .	655	106	429	68	61	799	350	62	2372	54	30	347	943	18	68
Etah	569	61	242	56	24	340	245	6	1861	24	12	94	40	9	65
Muttra . . .	415	128	1060	98	43	407	321	47	733	28	167	476	490	79	37
Farukhabad. .	809	111	325	14	38	2538	63	54	2323	266	15	27	11	52	2
Mainpuri. . .	513	80	349	38	14	366	524	6	1771	10	8	227	72	18	...
Agra	1120	79	1913	64	60	452	441	51	869	22	262	847	577	19	13
Etawah . . .	85	12	449	30	21	1450	46	19	820	11	1	32	38	75	3
Cawnpore . .	921	67	2798	30	174	1609	149	23	1161	922	45	420	514	682	67
Fatehpur. . .	286	164	1300	10	11	524	666	4	406	917	10	205	370	193	6
Jaunpur . . .	71	863	2863	678	408	8251	615	15	1441	813	574	292	102	1820	789
Hamirpur . .	163	5	2059	7	8	77	54	1	1183	934	545	248	5655	181	66
Banda. . . .	658	...	1393	92	35	202	790	7	1166	694	1545	1455	1626	698	86
Allahabad . .	196	622	2914	199	171	3615	876	15	1383	1985	253	577	839	1679	274
Gorakhpur . .	3239	3995	8593	2720	61	3004	429	3988	2662	893	4448	1601	1160	5821	2535
Basti	2327	564	4349	4997	49	9537	106	964	4028	2338	5296	568	445	8505	4711
Azamgarh . .	534	1554	8816	1311	224	2592	1035	356	1647	2116	1403	2125	330	1435	3117
Ghazipur. . .	829	1984	9763	373	258	619	1304	126	675	2773	1326	978	722	230	2127
Benares . . .	159	1174	3527	434	660	1412	1742	251	1094	1872	925	661	614	745	806
Mirzapur. . .	92	2014	4855	937	127	1618	1300	109	2247	3612	1117	1194	271	1644	692
Jalaun . . .	13	12	2578	9	2	66	48	2	499	137	55	460	163	4	2
Jhánsi. . . .	...	...	1794	...	...	...	2	...	11	...	8	124	328	...	...
Lalitpur . . .	...	...	2702	...	1	2	...	...	2	3	153	502	1	...	1
Kheri. . . .		25	71	113	1	435	517	4	458	553	709	11	1326	4681	917
Sitapur . . .		1140	2018	1865	77	595	98	10	1464	28	1396	30	312	4604	164
Hardoi . . .		204	339	82	33	3103	11	2	2973	32	5	12	30	5997	1
Lucknow. . .		409	831	14	858	1245	159	6	1251	1117	182	329	88	1547	319
Bara Banki . .		123	1272	910	4612	1536	86	8	1147	654	527	38	252	3109	793
Unao		113	2603	23	211	1926	226	2	1605	1428	5	43	132	754	137
Rae Bareli . .		129	4779	619	2575	2583	2028	4	1573	6635	194	33	30	920	168
Sultanpur . .		905	2255	1130	5704	2364	68	2	2807	1712	592	983	45	5122	1335
Partabgarh . .		353	1762	180	1329	6129	216	...	829	971	300	472	47	1425	342
Bahraich . .		159	1274	1165	1	2256	91	5	3376	1981	2188	77	1549	2640	423
Gonda . . .		1010	3554	5983	73	3545	371	...	3804	5409	4860	263	1271	6122	1681
Fyzabad . . .		1049	2376	3284	55	849	90	25	2034	1487	2503	1447	189	3062	2744
No information for Oudh districts.															

N.B.—The district of Bareilly includes Pilibhit, and that of Ghazipur includes Ballia.

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the North-Western Provinces and Oudh for the Twenty Years from* 1862 *to* 1881.

Years.	Cholera Deaths Registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches and Cents.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera generally prevalent over the whole of the provinces.															No information.	?
1863	Cholera generally prevalent except in Rohilkhand.																?
1864	Cholera widely diffused, but in abating prevalence.																26·27
1865	Cholera widely diffused and partially epidemic.																37·36
1866	Cholera generally diffused and epidemic in the western districts.																34·46
1867	110	156	760	4,667	9,210	9,461	5,705	7,110	7,650	8,201	3,924	1,323	?	?	56,367	1·92	50·87
1868	517	301	797	1,606	2,476	2,130	2,487	2,003	1,534	828	361	251	?	?	20,910	0·51	24·96
1869	441	358	1,681	4,452	6,923	12,630	14,383	22,837	7,594	5,384	1,241	397	?	?	92,929	2·28	36·49
1870	230	527	1,263	4,216	7,641	3,473	1,361	1,725	1,861	2,506	2,600	1,038	?	?	28,441	0·70	49·68
1871	291	215	265	745	727	526	434	569	1,031	3,964	6,704	4,034	10,242	9,263	19,505	0·48	54·69
1872	377	178	3,492	18,477	16,970	10,748	4,486	8,038	6,507	5,986	1,518	354	43,066	34,065	77,131	1·83	41·92
1873	242	345	605	1,608	1,623	3,331	2,508	3,546	3,534	1,191	480	196	10,582	8,647	19,209	0·46	35·18
1874	36	28	47	101	197	238	134	389	1,559	2,911	743	81	3,607	2,857	6,464	0·15	48·53
1875	35	216	1,923	14,757	9,816	7,557	5,305	6,396	10,051	5,263	1,717	1,391	36,204	28,223	64,427	1·54	39·44
1876	65	198	556	2,348	8,757	16,500	8,651	4,217	4,629	1,798	631	61	26,251	22,060	48,411	1·13	31·47
1877	18	63	3,865	8,698	7,004	3,480	3,522	2,363	972	1,120	449	216	16,955	14,815	31,770	0·74	23·18
1878	35	85	133	837	862	2,877	2,585	4,159	3,333	3,952	2,398	975	12,261	9,960	22,231	0·80	35·27
1879	64	35	259	4,731	8,062	7,969	5,290	3,947	2,431	2,420	654	30	19,493	16,399	35,892	0·81	51·35
1880	30	50	1,795	21,046	9,945	7,706	6,335	15,100	4,262	2,973	1,733	571	37,492	34,054	71,546	1·67	28·68
1881	46	96	924	7,935	7,462	4,184	2,380	998	485	340	687	327	13,429	12,435	25,864	0·58	37·08
Totals and Means	2,537	2,851	18,365	96,224	97,675	92,810	65,566	83,397	57,433	48,927	25,840	11,245	249,582	192,778	621,097	1·40	38·16

N. B.—The monthly figures for the years 1867, 1868, and 1869 are for the North-Western Provinces only; in all the subsequent years they include Oudh also. The total deaths of 1867 are for the North-Western Provinces only; the total deaths of 1868 and 1869 include Oudh also.

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in the North-Western Provinces and Oudh in Inches and Cent. for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	Rainfall in Inches and Cents in the Months of												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	No information.												?
1863													?
1864	0·39	0·60	0·16	0·21	1·04	1·11	8·04	9·03	5·44	0·19	0·05	0·01	26·27
1865	0·85	1·05	2·06	0·43	2·10	1·73	9·92	12·14	6·76	0·13	0·00	0·19	37·36
1866	1·08	0·81	0·00	0·73	0·00	3·27	13·62	10·69	4·16	0·10	0·00	0·00	34·46
1867	0·81	1·16	0·42	0·53	1·31	7·93	15·52	13·04	6·62	3·05	0·00	0·48	50·87
1868	1·20	1·52	0·55	0·59	0·94	4·15	8·75	3·27	3·82	0·07	0·00	0·10	24·96
1869	0·64	0·22	1·49	0·01	0·05	1·50	9·34	6·63	10·64	5·29	0·00	0·68	36·49
1870	0·06	0·27	1·41	0·52	0·30	7·63	14·06	14·75	8·31	2·27	0·00	0·10	49·68
1871	0·44	1·08	0·04	0·40	2·62	9·15	17·68	11·49	10·45	0·00	0·00	1·34	54·69
1872	2·19	0·57	0·44	0·17	0·46	5·18	13·40	13·49	5·91	0·02	0·01	0·08	41·92
1873	0·40	0·12	0·74	0·01	0·87	1·09	15·19	8·46	8·14	0·05	0·02	0·09	35·18
1874	0·43	0·62	0·48	0·02	0·23	9·80	15·23	12·70	8·42	0·58	0·01	0·01	48·53
1875	0·34	1·45	0·01	0·01	1·00	3·20	11·85	12 57	8·75	0·15	0·00	0·10	39·44
1876	0·10	0·02	0·36	0·39	0·32	1·35	12·23	7·16	7·69	1·94	0·00	0·00	31·47
1877	2·13	1·59	0·83	0·52	0·80	2·14	4·10	3·16	1·72	3·82	0·05	2·32	23·18
1878	1·92	0·51	0·26	1·03	1·70	1·88	9·37	11·61	6·79	0·06	0·06	0·08	35·27
1879	0·10	0·42	0·28	0·04	0·24	6·22	17·27	15·91	7·75	2·81	0·00	0·31	51·35
1880	0·17	1·28	0·00	0·07	1·13	3·03	12·13	3·21	6·47	0·31	0·53	0·35	28·68
1881	0·06	0·31	1·91	0·08	1·06	5·62	10·59	14·43	2·45	0·57	0·00	0·00	37·08
Means	0·74	0·75	0·63	0·32	0·89	4·22	12·12	10·21	6·68	1·19	0·04	0·23	38·04

NOTE.—For the years 1864 to 1868 inclusive the rainfall is for the North-Western Provinces, exclusive of Oudh. For the years 1869 to 1881 inclusive it is for both the North-Western Provinces and Oudh taken together.

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the North-Western Provinces and Oudh, together with the Average Strength and Ratio of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Totals.			Ratio per Mille of Strength.	
		Cholera.			Cholera.			Cholera.			Cholera.			
	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Strength.	Admissions.	Deaths.	Admissions.	Deaths.
1862	19,138	272	182	17,176	37	14	19,981	60	24	56,295	369	220	6·91	3·98
1863	19,918	219	151	15,549	36	17	20,467	685	331	55,934	940	499	16·82	8·92
1864	17,771	85	67	15,981	19	8	21,191	331	119	54,943	435	194	7·90	3·53
1865	15,305	83	66	13,688	48	27	20,725	92	42	49,718	223	135	4·41	2·71
1866	13,612	24	12	12,732	42	25	21,538	7	2	47,882	73	39	1·52	0·81
1867	14,463	233	187	14,024	38	27	21,850	157	49	50,337	428	263	8·50	5·22
1868	12,984	23	10	15,376	12	7	22,496	15	9	50,856	50	26	0·97	0·51
1869	14,713	430	277	14,202	66	39	27,695	191	94	56,610	687	410	12·13	7·24
1870	13,542	19	9	14,923	12	8	25,005	108	33	53,470	139	50	2·59	0·93
1871	14,940	31	19	14,582	11	6	22,793	10	5	52,315	52	30	0·99	0·57
1872	15,263	252	160	12,886	41	27	25,051	144	68	53,200	437	255	8·21	4·79
1873	15,119	38	26	13,841	22	11	28,201	95	46	57,161	155	83	2·71	1·45
1874	15,697	2	2	13,275	2	1	30,839	55	30	59,811	59	33	0·98	0·55
1875	16,653	123	90	14,108	38	20	30,734	34	20	61,495	195	130	3·07	2·11
1876	16,131	35	23	13,827	17	8	21,497	2	1	59,455	54	32	0·90	0·54
1877	15,887	12	10	14,159	8	4	27,881	65	31	57,927	85	45	1·46	0·78
1878	15,693	186	135	12,465	15	8	39,500	168	93	67,658	369	236	5·45	3·49
1879	12,777	30	16	10,985	25	15	33,535	8	5	57,297	63	36	1·09	0·63
1880	12,666	152	107	9,537	27	15	28,238	37	11	50,441	216	133	4·28	2·64
1881	13,267	44	29	14,184	10	6	24,724	6	3	52,175	60	38	1·11	0·73

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the North-Western Provinces and Oudh for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	19,138	11,319	2·40	68	17,176	10,282	0·37	38	19,981	10,948	0·54	40
1863	19,918	7,542	2·90	68	15,549	7,441	0·48	47	20,467	14,150	4·80	48
1864	17,771	7,888	1·08	78	15,981	6,658	0·28	42	21,191	11,424	2·90	35
1865	15,305	10,359	8·01	79	13,688	6,647	0·72	56	20,725	11,110	0·83	45
1866	13,612	5,690	0·42	50	12,732	?	?	59	21,538	3,630	0·19	28
1867	14,463	10,957	2·10	80	14,024	9,020	0·40	30	21,850	10,895	1·40	31
1868	12,984	7,018	0·30	43	15,376	5,488	0·20	58	22,496	3,900	0·40	60
1869	14,713	11,395	3·77	64	14,202	8,539	0·77	59	27,695	13,899	1·37	49
1870	13,542	4,184	0·45	47	14,923	6,759	0·18	67	25,005	2,964	3·64	30
1871	14,940	5,046	0·61	61	14,582	4,702	2·34	54	22,793	1,227	0·81	50
1872	15,263	11,298	2·23	63	12,886	6,475	0·63	66	25,051	9,315	1·54	47
1873	15,119	7,934	0·48	68	13,841	8,337	0·26	50	28,201	8,839	1·07	48
1874	15,697	3,447	0·06	100	13,275	434	0·46	50	30,839	4,765	1·15	54
1875	16,653	11,182	1·10	73	14,108	8,603	0·44	53	30,734	7,466	0·45	59
1876	16,131	5,883	0·59	66	13,827	6,600	0·26	47	21,497	2,466	0·08	50
1877	15,887	4,698	0·25	83	14,159	4,643	0·17	50	27,881	1,948	3·34	48
1878	15,693	7,910	2·35	72	12,465	3,892	0·38	53	39,500	15,564	1·08	55
1879	12,777	6,002	0·50	53	10,985	6,629	0·38	60	33,535	2,172	0·37	62
1880	12,666	7,554	2·01	70	9,537	4,240	0·64	55	28,238	8,410	0·44	30
1881	13,267	7,582	0·58	66	14,184	2,651	0·38	60	24,724	3,236	0·18	50

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera, as represented by the Death-rates registered among the Troops and Jails, and among the Civil Population, of the North-Western Provinces and Oudh for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Wheat.*

Years.	Cholera Death-rate per Mille of Strength or of Population.					Average Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Cents. per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Population.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	9·45	0·80	1·20	3·98	No information.	?	?	?	?	?	28·10
1863	7·50	1·02	16·10	8·92		?	?	?	?	?	26·99
1864	3·70	0·50	5·60	3·53		26·27	1·15	2·36	22·51	0·25	21·39
1865	4·30	1·90	2·02	2·71		37·36	3·96	4·26	28·82	0·32	16·41
1866	0·80	1·90	0·09	0·81		34·46	1·89	4·01	28·46	0·10	16·24
1867	12·90	1·90	2·20	5·22	1·92	50·87	2·39	9·77	35·18	3·53	19·57
1868	0·80	0·40	0·40	0·51	0·51	24·96	3·27	5·68	15·84	0·17	18·64
1869	1·83	2·75	3·90	7·24	2·28	36·49	2·35	1·56	26·61	5·97	11·91
1870	0·66	0·54	1·32	0·93	0·70	49·68	1·74	8·45	37·12	2·37	15·62
1871	1·27	0·41	0·22	0·57	0·48	54·69	1·56	12·17	39·62	1·34	23·56
1872	10·48	2·09	2·71	4·79	1·83	41·92	3·20	5·81	32·80	0·11	17·14
1873	1·72	0·79	1·63	1·45	0·46	35·18	1·26	1·97	31·79	0·16	15·22
1874	0·13	0·07	0·97	0·55	0·15	48·53	1·53	10·05	36·35	0·60	17·26
1875	5·40	1·42	0·65	2·11	1·54	39·44	1·80	4·21	33·17	0·25	22·58
1876	1·42	0·58	0·03	0·54	1·13	31·47	0·48	2·06	26·99	1·94	26·30
1877	0·63	0·28	1·11	0·78	0·74	23·18	4·55	3·46	8·98	6·19	16·20
1878	8·60	0·64	2·35	3·49	0·80	35·27	2·69	4·61	27·77	0·20	14·04
1879	1·25	1·36	0·15	0·63	0·81	51·35	0·80	6·50	40·93	3·12	14·20
1880	8·45	1·57	0·39	2·64	1·67	28·68	1·45	4·23	21·81	1·19	21·93
1881	2·18	0·42	0·12	0·73	0·60	37·08	2·28	6·76	27·47	0·57	19·49

No. VI.—STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the North-Western Provinces and Oudh for the Years* 1864 *to* 1881 *inclusive.*

Districts and Stations.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Kumaun (Nainital) . .	57·20	82·10	73·40	96·70	88·70	78·30	106·70	91·20	114·60	50·90	96·70	82·90	68·60	69·00	70·60	135·40	121·20	72·40
Garhwál (Pauri) . .	38·50	49·50	57·80	55·20	40·60	43·40	47·30	59·40	63·80	40·60	56·10	50·70	38·70	48·90	48·30	59·10	49·30	46·70
Tarái (Rudarpur) . .	39·00	49·60	33·30	56·30	29·30	47·20	43·60	74·90	49·40	27·30	55·40	41·40	24·50	26·00	56·10	73·90	42·50	41·60
Bijnor	35·10	35·80	26·40	49·50	28·40	33·20	42·80	46·40	43·10	41·30	51·90	50·40	33·80	16·30	37·10	41·20	49·30	40·90
Moradabad . . .	35·10	42·30	26·80	51·90	23·40	29·50	51·00	51·50	43·20	49·10	57·20	46·00	34·20	37·10	45·60	78·90	36·60	41·14
Bareilly	32·70	49·00	32·00	57·00	28·70	43·50	50·20	52·10	47·40	33·40	57·40	47·50	26·30	23·70	58·80	79·58	28·95	38·35
Sháhjahánpur . . .	24·40	36·70	27·00	63·30	24·90	27·80	45·80	48·10	37·20	32·30	48·80	32·10	26·50	22·20	54·70	69·50	23·10	36·60
Budaun	24·70	32·20	21·70	37·50	18·80	27·60	41·30	42·10	43·60	33·20	60·40	34·50	22·30	18·70	40·50	56·70	22·80	33·20
Dehra Dun . . .	57·90	73·10	76·00	67·70	53·10	80·40	85·10	106·10	81·00	61·80	98·40	78·20	79·70	37·00	84·82	108·74	84·42	95·46
Saharanpur . . .	32·60	35·50	32·30	51·40	24·20	27·10	37·40	53·00	37·20	41·00	44·90	33·50	39·30	27·70	36·60	25·60	43·20	30·90
Muzaffarnagar . . .	25·60	30·90	27·60	35·60	17·80	24·80	40·90	35·20	32·50	29·60	43·80	33·00	23·20	28·20	35·50	23·20	42·00	27·00
Meerut	18·00	23·20	27·90	35·40	15·60	20·40	40·00	32·40	29·00	26·60	37·50	33·70	16·10	21·80	28·00	35·57	45·26	32·86
Bulandshahr . . .	14·70	19·20	23·40	40·40	13·20	23·70	32·40	27·70	28·40	35·00	32·40	36·20	20·00	16·70	17·90	47·60	27·10	20·00
Aligarh	12·10	21·30	29·70	27·80	11·20	26·26	29·30	32·30	30·20	30·90	32·40	23·90	20·50	11·10	30·10	36·50	14·00	27·70
Etah	25·60	31·60	26·80	50·80	10·80	26·80	25·40	26·20	30·30	25·40	33·90	19·80	25·90	14·60	19·90	46·30	13·80	35·30
Muttra	24·10	22·50	31·40	27·40	13·60	22·80	28·90	39·50	34·40	50·40	32·60	27·20	22·20	10·50	14·40	33·40	19·44	28·50
Farukhabad . . .	25·50	26·80	24·60	49·20	15·60	34·20	42·10	31·90	34·00	29·30	50·10	27·80	25·70	20·40	24·10	53·00	16·05	27·50
Mainpuri	19·70	26·00	36·50	51·30	15·00	35·40	39·00	43·40	32·00	24·80	52·10	37·60	31·90	10·60	19·20	40·40	15·85	43·50
Agra	18·80	26·60	26·30	31·20	19·90	29·60	26·10	39·50	26·20	46·50	31·70	33·80	27·00	10·00	17·25	29·60	14·99	35·01
Etawah	21·40	26·80	26·70	36·80	16·80	39·50	48·60	42·80	27·90	42·30	37·80	30·90	20·40	12·70	23·90	25·90	11·80	30·40
Cawnpore	19·60	27·60	26·60	52·80	11·10	33·90	41·40	35·20	41·20	29·80	27·10	28·90	21·30	16·70	22·50	28·10	7·10	37·80
Fatehpur	14·90	26·80	28·50	50·50	23·20	42·10	53·40	46·30	43·00	41·50	34·70	30·30	30·70	17·35	28·90	33·00	11·70	39·40
Jaunpur	18·00	39·90	34·50	53·80	46·00	47·10	62·40	78·20	33·00	26·90	59·70	44·00	35·00	33·80	49·50	64·80	32·10	46·10
Hamirpur	15·90	29·10	35·20	52·50	18·20	39·60	46·10	41·40	39·50	38·40	46·00	35·50	31·80	13·20	26·80	22·60	10·40	27·31

STATEMENT No. VI.—*Continued.*

Districts and Stations.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Banda	15·60	32·10	34·20	64·50	26·50	40·50	46·10	35·70	31·50	32·80	34·00	47·80	41·10	19·40	29·90	36·20	22·80	33·70
Allahabad	15·70	33·40	26·60	50·60	24·90	46·00	51·40	60·40	42·40	35·60	35·30	41·50	30·00	18·60	23·40	42·35	20·24	34·83
Gorakhpur	25·10	51·40	55·40	59·60	26·60	40·90	54·20	72·50	68·80	39·00	60·80	37·00	40·50	24·30	30·00	77·32	43·73	51·58
Basti	59·26	59·26	38·90	56·60	46·10	65·80	57·40	70·40	53·90	21·20	55·80	39·50	38·90	21·10	37·20	56·20	37·10	30·00
Azamgarh	17·30	36·70	31·60	53·90	13·70	38·90	53·20	65·00	52·60	31·10	48·70	51·50	26·30	19·60	42·00	53·70	42·90	45·90
Ghazipur	13·50	49·20	43·90	50·60	27·60	39·40	53·30	49·50	31·90	27·80	55·00	40·00	27·40	16·35	32·50	53·05	37·40	32·90
Benares	19·40	34·30	27·80	54·00	36·60	38·70	45·90	56·30	33·30	35·30	65·30	46·10	25·80	27·90	30·30	51·09	26·36	35·07
Mirzapur	26·90	32·10	45·20	56·00	36·30	28·80	60·00	60·60	43·60	36·60	49·40	62·70	43·60	24·20	32·60	45·60	19·60	37·50
Jalaun	16·00	28·70	26·10	40·20	10·00	31·50	35·20	50·40	27·60	28·80	41·00	41·80	31·20	12·50	26·40	41·80	12·70	48·10
Jhánsi	38·48	38·90	31·00	52·30	13·30	26·30	31·60	45·70	35·90	44·10	31·20	25·00	37·70	15·80	25·30	47·24	20·32	53·85
Lalitpur	21·10	47·30	32·90	60·20	13·80	50·90	32·40	51·20	23·20	60·10	43·70	41·10	43·60	20·30	26·40	44·50	17·60	37·60
Kheri						24·40	63·70	72·00	48·50	27·80	58·10	28·90	45·10	30·00	65·90	49·50	24·20	23·60
Sitapur						20·10	56·50	51·40	34·70	28·90	49·40	33·10	35·20	19·20	40·77	64·30	19·58	27·80
Hardoi						25·30	46·00	45·00	50·60	19·40	44·70	40·10	30·70	26·30	26·80	41·10	25·30	34·10
Lucknow						34·70	61·20	64·90	35·70	33·50	52·10	46·10	22·70	14·40	34·60	38·32	17·38	32·72
Bari Banki (Nawabganj)						25·80	56·10	73·80	36·20	33·80	42·40	36·30	25·70	19·10	33·40	59·10	16·80	31·50
Unao	No information for these years.					33·80	58·00	41·50	45·70	29·10	39·30	24·50	21·70	18·60	29·75	31·50	12·10	36·15
Rae Bareli						35·30	48·70	47·00	35·40	43·60	37·90	35·40	26·70	11·20	25·30	34·50	7·30	20·70
Sultanpur						41·50	54·80	69·10	55·00	39·40	60·90	47·60	34·40	47·60	30·80	56·80	27·20	24·30
Partabgarh						37·43	64·60	66·80	35·50	30·30	31·20	38·90	26·10	20·63	26·40	56·00	21·35	40·35
Bahraich						34·00	72·00	75·90	37·90	30·10	47·30	36·60	34·20	32·10	32·90	64·70	45·50	31·20
Gonda						25·70	62·20	81·50	45·50	22·00	64·60	35·70	26·00	41·95	36·80	64·30	25·70	31·00
Fyzabad						46·00	63·30	87·20	42·70	35·00	53·90	36·70	18·90	23·80	47·40	56·20	21·90	32·80

NOTE.—The rainfall of Basti for the years 1864 and 1865 is the average of the five years 1867 to 1871, and that of Jhánsi for the year 1864 is the average of the five years 1865 to 1869.

I now proceed to describe the history of cholera in the North-Western Provinces and Oudh as recorded in the official reports for each year of the above series in the order of succession.

1862.—There are no statistics available to show the monthly prevalence of cholera among the civil population of these provinces until the year 1867. For the preceding years the returns for the troops and jail populations are our only guide to the annual prevalence of the disease in the general area of the North-Western Provinces and Oudh. The incidence of the cholera of 1862 among the troops and jails fixes some of the places in which the disease was prevalent in these provinces during this year.

Among the European troops, total average strength 19,138, there were altogether 272 admissions and 182 deaths from cholera, giving a death-rate of 9.45 per mille of strength. Out of the 27 stations occupied by European troops in these provinces, the 12 following recorded cholera in 1862, viz.:—Benares, strength 1142, admissions 1 and deaths 0; Lucknow, 2093, 2 and 0; Sitapur, 606, 1 and 0; Allahabad, 1202, 2 and 1; Shâhjahânpur, 530, 3 and 3; Nainital, 339, 1 and 0; Meerut, 2038, 52 and 32; Agra, 1153, 66 and 49; Gwalior, 237, 26 and 20; Morar, 1048, 66 and 39; Sipri, 164, 1 and 1; and Jhânsi, 767, 51 and 37 respectively. Of the 272 admissions, there were 1 February, 2 in March, 3 in April, 1 in May, 4 in June, 57 in July, 177 in August, 22 in September, 4 in October, and 1 in December.

Among the Native troops, total average strength 17,176, there were altogether 37 admissions and 14 deaths from cholera, giving a death-rate of 0.80 per mille of strength. Out of the 25 stations occupied by Native troops in these provinces, the 12 following recorded cholera in 1862, viz.:—Meerut, strength 1103, admissions 7 and deaths 2; Aligarh, 291, 1 and 1; Dehra Dun, 752, 3 and 3; Almorah, 709, 2 and 1; Agra, 682, 3 and 0; Morar, 1629, 7 and 5; Jhânsi, 795, 2 and 1; Lucknow, 1316, 2 and 0; Sitapur, 1050, 4 and 0; Allahabad, 488, 2 and 1; Cawnpore, 817, 3 and 0; and Nagode, 650, 1 and 0 respectively. Of the 37 admissions, there were 2 in February, 3 in March, 5 in April, 6 in May, 3 in June, 4 in July, and 14 in August.

Among the jail populations, total average strength 19,981, there were altogether 60 admissions and 24 deaths from cholera, giving a death-rate of 1.20 per mille of strength. Out of the 46 jails in these provinces, the 16 following recorded cholera in 1862, viz.:—Ghazipur, strength 650, admissions 1 and deaths 0; Benares, 1718, 1 and 1; Mirzapur, 320, 1 and 0; Azamgarh, 425, 1 and 1; Bahraich, 118, 1 and 1; Fyzabad, 766, 1 and 0; Lakhimpur, 79, 2 and 0; Dariabad, 85, 1 and 1; Alambagh, 921, 2 and 0; Unao, 95, 2 and 0; Lucknow, 882, 8 and 0; Sitapur, 428, 3 and 2; Allahabad, 1979, 2 and 1; Agra, 2209, 23 and 12; Bijnor, 162, 1 and 0; and Almorah, 111, 10 and 5 respectively. Of the 60 admissions, there were 2 in February, 5 in March, 9 in April, 2 in May, 6 in June, 8 in July, 26 in August, 1 in October, and 1 in December.

From the different stations shown to be affected by cholera in the above returns, it appears that the disease was generally diffused over the whole area of these provinces in 1862, and with the maximum degree of intensity during the months from June to September inclusive, that is, during the season of the hot-weather or south-west monsoon rains.

1863.—In this year there appears to have been a revived epidemic activity of cholera over the general area of these provinces, except in the Rohilkhand division. The death-rate of the year from the disease among the troops and jails together was 8.92 per mille of strength against 3.98 in

the preceding year, and the increased mortality was mostly contributed by the jail populations (see Table No. V.)

Among the European troops, total average strength 19,918, there were altogether 219 admissions and 151 deaths from cholera, giving a death-rate of 7.50 per mille of strength. Of the 27 stations occupied by the European troops in these provinces, the 6 following recorded cholera in 1863, viz. :—Benares, strength 1210, admissions 44 and deaths 35; Lucknow, 2420, 46 and 25; Cawnpore, 1162, 24 and 24; Allahabad, 1054, 54 and 44; Agra, 1115, 32 and 21; and Muttra, 581, 2 and 0 respectively. Of the 219 admissions, there were 4 in January, 1 in March, 13 in April, 3 in May, 97 in July, 74 in August, 9 in September, and 8 in October.

Among the Native troops, total average strength 15,549, there were altogether 36 admissions and 17 deaths from cholera, giving a death-rate of 1.02 per mille of strength. Of the 24 stations occupied by the Native troops in these provinces, the 10 following recorded cholera in 1863, viz. :—Benares, strength 563, admissions 8 and deaths 5; Gorakhpur, 533, 2 and 2; Lucknow, 1717, 9 and 2; Fatehgarh, 449, 1 and 0; Cawnpore, 594, 3 and 1; Nagode, 602, 2 and 1; Allahabad, 643, 7 and 4; Meerut, 482, 1 and 0; Agra, 704, 2 and 1; and Morar, 1154, 1 and 1 respectively. Of the 36 admissions, there were 2 in January, 1 in February, 5 in April, 4 in May, 2 in June, 6 in July, 10 in August, 1 in September, 1 in October, and 3 in November.

Among the jail populations, total average strength 20,467, there were altogether 685 admissions and 331 deaths from cholera, giving a death-rate of 16.10 per mille of strength. Of the 44 jails in these provinces, the 22 following recorded cholera in 1863, viz. :—Ghazipur, strength 688, admissions 2 and deaths 2; Benares, 1412, 71 and 44; Mirzapur, 355, 11 and 4; Azamgarh, 415, 2 and 2; Jaunpur, 286, 10 and 5; Gonda, 78, 1 and 0; Gorakhpur, 826, 85 and 44; Bahraich, 102, 1 and 1; Fyzabad, 891, 25 and 9; Sultanpur, 506, 4 and 1; Rae Bareli, 153, 15 and 6; Lakhimpur, 95, 1 and 0; Dariabad, 57, 4 and 1; Unao, 95, 10 and 3; Lucknow, 1981, 305 and 153; Sitapur, 695, 5 and 2; Fatehgarh, 464, 6 and 3; Allahabad, 2233, 9 and 5; Agra, 2158, 110 and 42; Secundra, 251, 4 and 3; Etawah, 200, 3 and 0; and Aligarh, 209, 1 and 1 respectively. Of the 685 admissions, there were 1 in January, 3 in February, 6 in March, 6 in April, 16 in May, 38 in June, 382 in July, 125 in August, 10 in September, 44 in October, 50 in November, and 4 in December.

From the above records, the cholera of 1863 appears to have been very widely diffused over the area of these provinces, and to have been most severely prevalent in the Oudh districts.

1864.—In this year there was a marked abatement in the prevalence of cholera in these provinces; the death-rate from the disease among the troops and jails taken together was 3.53 per mille of strength against 8.92 in 1863, and the decrease was proportionally distributed between the different classes (see Table No. V.)

Among the European troops, total average strength 17,771, there were altogether 85 admissions and 67 deaths from cholera, giving a death-rate of 3.70 per mille of strength. Of the 27 stations occupied by these European troops, the 8 following recorded cholera in 1864, viz. :—Benares, strength 1081, admissions 7 and deaths 6; Azimgarh, 198, 1 and 1; Fyzabad, 964, 1 and 1; Lucknow, 2470, 55 and 39; Cawnpore, 1131, 6 and 6; Allahabad, 950, 13 and 12; Bareilly, 881, 1 and 1; and Nowgong, 213, 1 and 1 respectively. Of the 85 admissions, there were 2 in March, 1 in April,

2 in May, 3 in June, 4 in July, 5 in August, 67 in September, and 1 in October.

Among the Native troops, total average strength 15,981, there were altogether 19 admissions and 8 deaths from cholera, giving a death-rate of 0.50 per mille of strength. Of the 24 stations occupied by these Native troops, the 10 following recorded cholera in 1864, viz. :—Benares, strength 551, admissions 3 and deaths 2; Fyzabad, 679, 2 and 2; Lucknow, 1588, 3 and 2; Sitapur, 478, 1 and 0; Banda, 383, 2 and 0; Allahabad, 518, 2 and 2; Shâhjahânpur, 309, 1 and 0; Bareilly, 866, 2 and 0; Rurki, 895, 2 and 0; and Moradabad, 391, 1 and 0 respectively. Of the 19 admissions, there were 5 in April, 6 in May, 6 in June, and 2 in September.

Among the jail populations, total average strength 21,191, there were altogether 331 admissions and 119 deaths from cholera, giving a death-rate of 5.60 per mille of strength. Of the 44 jails in these provinces, the 14 following recorded cholera in 1864, viz. :—Ghazipur, strength 662, admissions 4 and deaths 3; Benares, 1306, 49 and 26; Mirzapur, 351, 4 and 1; Azamgarh, 358, 4 and 1; Gorakhpur, 727, 42 and 19; Fyzabad, 988, 56 and 19; Sultanpur, 528, 54 and 18; Partabgarh, 162, 1 and 0; Lucknow, 2550, 3 and 0; Sitapur, 779, 1 and 1; Etah, 206, 1 and 0; Banda, 258, 8 and 3; Allahabad, 2192, 103 and 28; and Moradabad, 357, 1 and 0 respectively. Of the 331 admissions, there were 6 in February, 5 in March, 62 in April, 52 in May, 138 in June, 14 in July, 52 in August, 1 in November, and 1 in December.

The above records show the cholera of 1864 to have been as widely diffused as that of the preceding year, but to have prevailed in a much lesser degree of severity.

The rainfall of 1864 was very considerably below the average for these provinces, and this defect was attended by a very marked rise in the prices of food.

1865.—Cholera still further abated in prevalence during this year, the death-rate from the disease among the troops and jails together having fallen to 2.71 per mille of strength against 3.53 in 1864. The abatement of the cholera of 1865 in these provinces was not so marked and general as was due in the normal course of the disease in this year, the third of the cycle 1863–65, and its complete subsidence was delayed until the following year. This abnormal activity of cholera in 1865 was coincident with, if not attributable to, heavy rainfall following upon a season of drought, for although the rainfall of 1865 (see Table No. V.) was but very slightly below the average, it was fully 11 inches above the fall of the preceding year. The prices of food, also, in 1865 ranged very high, and verged upon famine rates. In 1866, as we shall see, the rainfall differed in amount but a few inches from that of 1865, the prices of food remaining stationary; and the delayed subsidence of the periodical epidemic activity of cholera which commenced in 1863, the first year of the triennial cycle 1863–65, finally took place in the year 1866. These facts are in conformity with the view that cholera is dependent for its activity upon the effects of rainfall upon the soil —producing unusually active evaporation of moisture, with the concomitant sudden and extreme changes of temperature and humidity in the lower strata of the atmosphere.

Among the European troops, total average strength 15,305, there were altogether 83 admissions and 66 deaths from cholera, giving a death-rate of 4.30 per mille of strength. Of the 22 stations occupied by these European troops, the 9 following recorded cholera in 1865, viz. :—Benares, strength 998,

admissions 11 and deaths 9; Fyzabad, 953, 13 and 11; Lucknow, 1884, 23 and 20; Cawnpore, 880, 1 and 1; Allahabad, 1013, 14 and 10; Bareilly, 853, 3 and 3; Meerut, 1783, 3 and 2; Morar and Gwalior, 1328, 14 and 10; and Jhánsi, 667, 1 and 0 respectively. Of the 83 admissions, there were 4 in January, 27 in April, 3 in May, 2 in July, 31 in August, 14 in September, 1 in October, and 1 in November.

Among the Native troops, total average strength 13,688, there were altogether 48 admissions and 27 deaths from cholera, giving a death-rate of 1.90 per mille of strength. Of the 22 stations occupied by these Native troops, the 9 following recorded cholera in 1865, viz.:—Benares, strength 595, admissions 4 and deaths 2; Fyzabad, 705, 7 and 6; Lucknow, 1569, 3 and 2; Banda, 372, 1 and 0; Cawnpore, 573, 10 and 4; Jhánsi, 921, 12 and 6; Morar, 1165, 9 and 7; Agra, 647, 1 and 0; and Dehra Dun, 100, 1 and 0 respectively. Of the 48 admissions, there were 3 in May, 14 in June, 9 in July, 14 in August, 7 in September, and 1 in October.

Among the jail populations, total average strength 20,725, there were altogether 92 admissions and 42 deaths from cholera, giving a death-rate of 2.02 per mille of strength. Of the 46 jails in these provinces, the 12 following recorded cholera in 1865, viz.:—Benares, strength 1193, admissions 2 and deaths 1; Azamgarh, 474, 1 and 1; Gorakhpur, 664, 2 and 2; Fyzabad, 867, 1 and 1; Sultanpur, 450, 1 and 1; Rae Bareli, 130, 3 and 1; Sitapur, 875, 31 and 11; Banda, 289, 1 and 0; Allahabad, 2346, 8 and 2; Agra and Secundra, 1933, 32 and 20; Etawah, 192, 9 and 1; and Bareilly, 1697, 1 and 1 respectively. Of the 92 admissions, there were 1 in February, 1 in April, 2 in May, 16 in July, 39 in August, 32 in September, and 1 in October.

The rainfall in 1865 was 37.36 inches, or 0.80 of an inch below the average, but it was 11.09 inches above that of 1864; it thus fell upon a soil more or less parched by drought, and gave rise to an unusually active evaporation of moisture, as has already been noted. There was also a very considerable rise in the prices of food during 1865; the average price of wheat, the staple food-grain, rose to 16.24 sers the rupee against 21.39 sers in 1864.

1866.—In this year, the first of the triennial cycle 1866–68, the fresh revival of epidemic cholera activity, which was due in the normal periodicity of the disease in this country, did not take place until quite towards the close of the year; and this fact, coupled with the retarded subsidence of the preceding cycle's epidemic being prolonged into 1866, has caused the cholera of 1866, as represented in the returns, to appear as a cholera of minimum intensity, instead of, as due in the normal course, as a cholera of maximum intensity in this year of the cycle. The death-rate from the disease among the troops and jails together was only 0.81 per mille of strength in 1866 against 2.71 in 1865. This mild prevalence of cholera in 1866, as already pointed out, was coincident with a remarkable equability in the amount of the rainfall during the several quarters of the two years 1865 and 1866 (see Table No. V.), and to an equally remarkable equability in the prices of food during the same period.

Among the European troops, total average strength 13,612, there were altogether 24 admissions and 12 deaths from cholera, giving a death-rate of 0.80 per mille of strength. Of the 21 stations occupied by these European troops, the 7 following recorded cholera in 1866, viz.:—Benares, strength 645, admissions 10 and deaths 6; Azamgarh, 146, 1 and 0; Rae Bareli, 401, 1 and 0; Lucknow, 2241, 2 and 0; Fatehgarh, 235, 1 and 1; Allahabad, 1020,

8 and 4; and Agra, 1002, 1 and 1 respectively. Of the 24 admissions, there were 1 in March, 1 in April, 6 in July, 13 in August, 1 in September, 1 in October, and 1 in November.

Among the Native troops, total average strength 12,732, there were altogether 42 admissions and 25 deaths from cholera, giving a death-rate of 1.90 per mille of strength. Of the 22 stations occupied by these Native troops, the 6 following recorded cholera in 1866, viz.:—Benares, admissions 8 and deaths 5; Lucknow, 1 and 1; Agra, 3 and 0; Rohilkhand, 1 and 1; and Camp Agra and Meerut districts, 29 and 19 respectively. The strength of these several groups is not given in the returns. Of the 42 admissions, there were 3 in April, 4 in May, 1 in June, 1 in August, 31 in November, and 2 in December.

Among the jail populations, total average strength 21,538, there were altogether 7 admissions and 2 deaths from cholera, giving a death-rate of 0.09 per mille of strength. Of the 46 jails in these provinces, the 7 following recorded cholera in 1866, viz.:—Gonda, strength 951, admissions 1 and deaths 0; Partabgarh, 135, 1 and 0; Hardoi, 134, 1 and 0; Lakhimpur, 93, 1 and 0; Fatehgarh, 415, 1 and 1; Lalitpur, 115, 1 and 0; and Agra, 1787, 1 and 1 respectively. Of the 7 admissions, there were 3 in March, 2 in June, and 2 in August.

From the above records, it appears that the cholera of 1866 was in marked abeyance in these provinces until the month of November. In this month the disease broke out in epidemic force at Agra during the grand durbar held there by the Viceroy. In consequence of this outbreak of cholera it became necessary to break up the camp earlier than had been intended, "in order to prevent the spread of the disease." For some months previous to this, it is stated, cholera had been prevalent in some of the Native States of Rajputana, and "the camp of the Agent of the Governor-General, in marching up from Aboo in the middle of September, had to take a circuitous route through the Jodhpur territory in order to avoid the affected localities." On the 27th October the camp arrived at the village of Halena, in the Bhurtpur district, and halted the following day, Sunday. On the 29th the camp continued its march towards Agra, with 2 cases of cholera, the first which had occurred, and both of which proved fatal on the morning of the 29th. The camp then marched in two divisions towards Agra *viâ* Fatehpur Sikri, and on the 2d November arrived at the village of Buronda, 10 miles from Agra. Here the main portion of the camp was halted, the Agent taking only his personal staff and office establishment to cantonments on the morning of the 3d November. About noon on the 4th cholera appeared in the Agent's camp, and a few hours afterwards reappeared in a virulent form in the main encampment left at Buronda; 21 cases and 7 deaths occurred in little more than 24 hours after this outbreak at Buronda. "The disease subsequently gained a footing amongst the European and Native troops during the Viceroy's durbar, and also in the city of Agra. Among the European troops there were 12 cases and 7 deaths. Among the Native population generally, between the 4th and 26th November, 114 cases were ascertained to have occurred, and of these 64 proved fatal." The disease continued to follow some of the regiments on the march to their various destinations. The 36th Native Infantry, *en route* to Meerut, had 7 cases, with 5 deaths, between Ghaziabad and that station. During the months of November and December there were altogether 29 cases and 19 deaths among Native troops in camp and on the march in the Agra and Meerut districts, as shown in the returns above given. But as regards the

general population in this part of the North-Western Provinces, there are no data to show to what extent they suffered from the disease.

1867.—In this year the cholera of the cycle, which did not commence its periodic epidemic activity until late in the preceding year, prevailed with considerable violence and far-spreading diffusion, in which the greater portion of Northern India became involved. Among the civil population of the North-Western Provinces, exclusive of Oudh, the death-rate from the cholera of 1867 was 1.92 per mille of population. This increased activity of the cholera of 1867 in these provinces was coincident with a very unusually heavy rainfall, which exceeded that of the preceding year by nearly 16½ inches, and with a continuance of high prices for food, although rates were somewhat cheaper than in the preceding year (see Table No. V.) The heavy rainfall of 1867 commenced with the first quarter of the year, following a period of three months' drought during the last quarter of 1866, and continued excessive during the remaining quarters of 1867.

The incidence of cholera among the troops and jails in these provinces was proportionally severe in 1867 (see tabular statements Nos. III. and IV. at the head of this section).

In this year, for the first time, the registration of deaths among the civil population was commenced in the North-Western Provinces, and in the following year was extended to the Oudh districts also. The returns, so far as they go, are complete only for the last six months of the year, the figures for the first six months representing reported or estimated, and not registered, deaths; still they show the activity of cholera to have been very generally diffused over the whole extent of the North-Western Provinces, every one of the districts, excepting only Lalitpur and Jhánsi, recording the presence of the disease.

The cholera of 1867 in the North-Western Provinces was only a portion of the great epidemic of the disease which in that year swept over Northern India, and which acquired an unusual importance on account of its coincidence with the great *Kumbha mela*, or "twelfth-year fair," held at Hardwar, as well as on account of its being the first cholera epidemic of any great or widespread violence which visited the regions of Northern India subsequent to the great cholera epidemic of 1861, the history of which has been recorded in the report of the special commission which was appointed by the Government of India in that year "to trace its course, investigate its causes, and suggest what practical measures should be adopted in the future to arrest the progress of any such calamity."

A description of the circumstances attendant on the outbreak of the disease at the Hardwar Fair held in April 1867, as also of the locality of the fair itself, will be given in the history of the cholera of 1867 in the Panjab Province as a more convenient arrangement. In this place it is necessary to notice only such circumstances as have been recorded in connection with the prevalence of cholera in the North-Western Provinces and Oudh prior to and at the time of the outbreak at Hardwar.

In the review of the history of cholera in these provinces in 1866 it has been stated that the disease, after a period of marked subsidence or abeyance during the greater part of that year, broke out into epidemic activity at Agra during the Viceroy's durbar held there in November. Regarding the prevalence of the disease among the general population of the adjacent districts towards the latter part of 1866 there is no reliable or detailed information available. During December two fatal cases of cholera were recorded at Rurki, about 17 miles from Hardwar; and in the end of 1866 some cases

of cholera were said to have occurred at the Gurmukhtesar Fair, held 28 miles from Meerut; but nothing is known regarding these.

From all accounts, it appears that cholera was more or less prevalent in the districts to the west, south, and east of Hardwar at the close of 1866 and opening of 1867. The Panjab mortality tables for 1867 show a considerable activity of cholera in the Ambala, Ludhiana, and Kangra districts, and, in fact, in all the districts up to the River Ravi along the plain country at the foot of the Himalayas, during the first three months of the year. In Delhi and Kurnal the disease broke out with epidemic activity, though not to any great extent, in November 1866 (at the same time as the outbreak in Agra, before alluded to), and, in the former especially, continued prevalent all through the first three months of 1867. In the North-Western Provinces, although there are no mortuary returns to indicate the prevalence of cholera among the civil population during the first three months of 1867, there are some incidental records of the prevalence of the disease during the early part of 1867 in the districts to the eastward of Hardwar, which are of value as evidence of the presence of cholera in that part of the country prior to the assemblage at Hardwar. Thus in January 1867 cholera was prevalent in the Tarái tract at the foot of the hills, on the right bank of the River Gogra, where it issues from the hills, and appears to have attracted attention only through the accident of its breaking out in the camp of the Nepal troops, who had marched with Sir Jung Bahadur on his visit to the Raja of Kashipur.

Sir Jung Bahadur had marched up the Nepal frontier early in January with a camp of about 5000 men. During the march of 200 miles from Segowli to Baramdeo, on the left bank of the Gogra, where it issues from the hills, there was no appearance of any sickness. On the opposite bank of the river, however, cholera was known to be prevalent, and Sir Jung Bahadur was advised to prevent, as far as possible, communication with the affected districts. Under the circumstances of his visit this appears to have been impracticable, and free intercommunication was established during the interviews between Sir Jung Bahadur and the Raja of Kashipur, the subject of arrangement being the marriage of the former's son to the latter's daughter. In the course of a few days cholera broke out in the camp of the Nepal troops; and "Sir Jung Bahadur, finding that the disease had fairly gained a footing among his men, returned by forced marches, almost in the same track by which he had come; but the disease did not abate, and in the course of less than a fortnight it is stated that about 650 of his followers died."

This cholera in the Tarái of the Nepal and Kumaun Himalayas appears to have continued with persistent prevalence up to the period of the assemblage at Hardwar. It is recorded that many of the hill people of Kumaun and Garhwál suffered from cholera on their way to the fair at Hardwar, and that the disease was epidemic at the town of Bazpur, on the road to, and 50 miles distant from, Hardwar, on the 5th April, between which date and the 12th April there were 19 deaths from cholera in that town.

Regarding the Bhurtpur territory, it is recorded that "the district was never wholly rid of the disease from last season," and that cholera hung about in the neighbourhood of Bhurtpur all the cold weather, and that cases of what seemed choleraic diarrhœa were very common in December, January, and February. A few cases of cholera were recorded in February and March, and in the latter month the disease appears to have prevailed epidemically at Bindraban, near Muttra. The Maharaja of Bhurtpur visited Hardwar with a large retinue, and left his territory just about the time that cholera began to extend; but it does not appear that his camp suffered from the disease on the journey to the fair.

From the preceding account, it is clear that the influence which produces cholera was widely diffused over the country around and about the site of the Hardwar Fair, but that it did not assume any very marked general activity until the month of April, which is the usual period for the epidemic activity of cholera to commence in all parts of Northern India.

The circumstances connected with the outbreak of cholera at the Hardwar Fair of this year will be described farther on, in the history of the cholera of 1867 in the Panjab Province, to which the reader is referred. The main point made abundantly clear by all the accounts is, that the disease did not break out at Hardwar until about the height of the fair, which happened to be about the middle of the month of April. This, in Northern India, is the usual season for the revival of cholera activity in all years, but more especially so in epidemic years. And hence the explanation of the great mortality from the disease among the pilgrims dispersing from the fair of 1867 is not that they contracted the disease there, but that they, by far the greatest number of them, succumbed to the prevailing epidemic influence by reason of their predisposition to its effects through unfavourable conditions of health inseparable from the exposures, fatigues, and privations of the journey. No doubt the unwholesome conditions of life to which the pilgrims exposed themselves at the fair largely contributed towards producing this state of predisposition to the action of cholera; but these alone, without the operation of the epidemic influence of cholera, are insufficient, as all experience shows, to produce an epidemic prevalence of the disease.

Much stress has been laid upon the probability of the supposed *contagium* of cholera having been diffused through the multitude assembled at Hardwar by means of the filthy water gulped down as part of the religious ceremony performed at the sacred bathing-ghât. But here it must be borne in mind that this water, though foul enough, and possibly poisonous also, at the ghât itself, was still that of a running stream, and that, of the vast multitudes drinking of it, only a few, comparatively, could have imbibed any portion which we may assume to have been charged with the supposed cholera *contagium*.

As regards the probability of the disease having been caused by the contamination of the air and water through excrementitious pollution of the soil, either by the amount deposited on its surface or buried in its substance, it is to be observed that the evil consequences of such insanitary conditions are in full operation on all occasions of fairs held here; and on this occasion they were in operation for some weeks before cholera made its appearance. By their injurious effects upon the health of the body exposed to their action, these insanitary conditions, there is no doubt, very largely contribute to the other general causes on such occasions in operation to predispose the individual to the assaults of cholera when the cholera-producing influence is present; but without this presence they do not of themselves produce epidemic cholera. Nevertheless these sources of causes predisposing to cholera deserve the first attention, in order that, by adequate measures of precaution, they may be reduced to the very smallest attainable capacity for injury; and this is best effected by perfection of sanitary arrangements, and more especially in respect to the scavenging of ordure in particular. But when once the epidemic cholera influence has declared its presence in the locality, the only safe course is flight from that locality, or, in other words, dispersion of the multitudes crowded together in the area of local affection.

The history of the cholera epidemic of 1867 in Northern India is very fully described in the "Fourth Annual Report of the Sanitary Commissioner

with the Government of India." The condition of the pilgrims after the fair is thus graphically described by Dr. J. M. Cunningham—

"Terror-stricken, the vast crowd dispersed, many of them ill-clad and ill-fed, suffering from the effects of privation, all anxious to return as quickly as possible, and leave the dreaded foe behind. Their very eagerness to escape, the fatigue which attended long and harassing marches, made them fall but the more easy victims to the disease. The roads in every direction were crowded with the unfortunate devotees; but the main routes adopted were three—one south-east, through Rohilkhand and Oudh; a second south-west, through the Saharanpur, Muzaffarnagar, and Meerut districts; and a third north-west, through Saharanpur to the Panjab."

The following particulars regarding the disease in the districts of the North-Western Provinces and Oudh after the dispersion of the pilgrims from Hardwar are derived from the same source as the above quotation:—

As regards the extent of cholera prevalence in the various districts the information is very imperfect and unreliable, as the system of mortuary registration had only recently been introduced, and had as yet made but little progress. The records, such as they are, however, serve to show what effect the dispersion from Hardwar exercised in increasing the general mortality from cholera.

Hardwar is situated in the Saharanpur district. The first case of cholera recorded is that of the 9th April, in the cavalry detachment at Kankhal, the next at the fair itself on the 13th April, and the last on the 19th June. Between the two last dates 1323 cholera deaths are reported to have occurred among the people. The disease was chiefly confined to pilgrims. "It was on the 17th April, that is, four days after the arrival of the pilgrims at Saharanpur, that cholera first attacked in the town any individual who had not been to Hardwar." No cholera was reported to the civil surgeon from any town or village out of the line of march of the pilgrims, and, so far as he could discover, the cholera cases which first occurred in towns and villages were confined to those who had been present at Hardwar; "and in these places the pilgrims and the disease appeared for the most part simultaneously." In the Saharanpur jail, 180 prisoners, no cases of cholera occurred. In the cantonment of Rurki, 17½ miles from Hardwar, the first observed case of cholera occurred on the 13th April, the same day as the disease broke out at Hardwar, in the person of a pilgrim from Hardwar. Cholera soon became epidemic in the town, and lasted till the 27th May, up to which date there were 145 cases and 76 deaths. The European troops—a wing of H.M.'s 79th Regiment—entirely escaped, but there were two cases among the corps of Native Sappers and Miners. Up to the 19th April all the affected were returning pilgrims, with the exception of one case, which occurred in the person of the cook of the cholera hospital, who was attacked on the 18th or 19th. "The second non-pilgrim attacked was a thatcher of the town, and the third, on the morning of the 22d, was the compounder of the Ganges Canal Hospital, who was regularly on night duty at the cholera hospital."

In the Dehra Dun district, adjoining that of Saharanpur on the north-east, and extending close to Hardwar, the first case of cholera reported appeared on the 16th April, the sufferer being a traveller. No other case was reported till the 29th April, on which date there were 2 cases, and 2 more on the 30th. All these appear to have been residents of the district. In the jail, containing some 40 prisoners, there were 12 cases of cholera, with 2 deaths. In the Body Guard none of the troopers suffered; but 5 of the camp-followers were attacked, of whom 3 died. At the hill-station of Mussorie, 30 miles distant, and at an elevation of 7000 feet, the first case

occurred on the 27th April, in the wife of an officer who had just arrived from the plains. On the 30th there were 2 cases among natives, one of whom had arrived from Dehra two days previously. The disease lasted at Mussoorie till the 22d of May, up to which date there were 12 cases and 10 deaths. Landour, which is a convalescent depot for European invalids, and which adjoins Mussoorie, escaped entirely during April; but in May there were 4 deaths from cholera among the natives there.

The Muzaffarnagar district adjoins that of Saharanpur to the south, and the civil station of Muzaffarnagar is about 50 miles from Hardwar. The pilgrims from Hardwar began to stream into the district on the 15th April. On that date 3 cases of cholera were admitted into the dispensary, and 96 cases of sickness, including cholera, diarrhœa, fever, &c., were treated on the road. Many pilgrims were reported to have died of cholera on the road, and smallpox also was found to be prevalent amongst them. On the 16th April the stream of pilgrims became very dense, and continued so all through the following day. By far the greater number were travelling on foot, but "every conceivable form of vehicle appeared to have been called into use." Bullocks, camels, horses, elephants, mules and asses, and carts and carriages were seen. The women travelled mostly in covered carts, "crowded generally in parties of ten or twelve, with children, in each conveyance. It was in these that the worst cases occurred." On the 28th April the wife of the Native doctor in charge of the dispensary was seized with cholera, and died after a few hours' illness. She had not visited Hardwar. The total number of cases reported was 1146, and of deaths 737. The prisoners did not suffer. Of the total 1146 cases, 540 were in pilgrims, and 606 in other persons in the district. It is stated that "no cholera existed in the district previous to the Hardwar Fair;" but this is a bold assertion, without any grounds of accuracy, since there was no registration attempted until the disease had actually broken out at Hardwar.

In the Bijnor district, to the south-east of Saharanpur, and separated from it by the Ganges, cholera broke out on the 13th April, the same day that it burst out at the fair. On that date there were 23 cases and 22 deaths. During the first week 871 cases and 426 deaths were reported. The disease is said to have ceased altogether in the middle of June, by which time there had been 2201 cases and 1065 deaths. The jail altogether escaped.

In the Moradabad district the first case of cholera was observed on the 15th April, at the station of Moradabad, which is 86 miles distant from Hardwar, and up to the 12th of May 1247 cases and only 178 deaths were reported. It is stated that "the disease was not altogether confined to the pilgrims, but it was almost limited to the line of road taken by them through the district. Some of the non-pilgrims attacked were living in the same house with pilgrims who had just returned from Hardwar, and there was no cholera in the district until the pilgrims returned from Hardwar." Among the European troops, average strength nearly 300, quartered at Moradabad, there was no cholera whilst the disease was raging amongst the pilgrims passing through and whilst the Native troops suffered; but there were 4 cases in July, and 3 in August, and of the 7 cases 3 died. Among the Native troops, average strength 382, there were 5 cases, all fatal. The first was admitted on the 16th April, the second on the following day, and both were Sepoys who had returned with pilgrims from Hardwar. They were the only two attacked out of a party of 250 Sepoys who had obtained leave to visit the fair. Besides the above 5 cases, some few others occurred

among the Sepoys' families and camp-followers. The instance is related of a Sikh Sepoy's wife who was suckling her child at the time of her being attacked with cholera. "She recovered a very severe and lasting collapse. Both mother and child are now quite well, and the latter is still at the breast."

In the Kumaun district, and about 60 miles from Moradabad, is the hill-station of Nainital, with its convalescent depot for European soldiers. Here cholera was confined entirely to the Native community; there were altogether 22 cases between the 22d April and the 11th June. The first case appeared on the 22d April, in a female pilgrim from Hardwar, who arrived in the station on the 18th or 19th April suffering from "cholera and choleraic diarrhœa;" she was taken to the dispensary on the 22d in a state of collapse, and died on the following day. On the 22d April 4 other cases of cholera occurred among the servants of a European officer whose house was on the margin of the lake, and adjoining that in the compound of which the first case resided. These persons were not pilgrims, and had been for some time resident in the station; "but they were in frequent communication with and attendant on the preceding case." On the 23d and 24th April 4 fresh cases occurred in an adjoining compound, and then no other case appeared until the 7th May, when a native was attacked in a compound on the Ayah Puttah Hill; he had arrived four or five days previously from Kaladungi, at the foot of the hills, where cholera was raging. On the following day a sweeper and a coolie living in the large bazar were attacked; the former had arrived on the 3d April from a village in the plains, about 40 miles from Kaladungi, on the Hardwar road; and the latter had also come from an affected locality two or three days before he was attacked.

"In all the other cases which occurred in various parts of the station between the 10th May and 11th June, the cholera was entirely of a sporadic nature, and showed no tendency whatever to spread by contagion. On some occasions a jampani would be attacked while living with three or four others in a small outhouse 8 feet by 10 feet, and would not be removed until collapse had fairly set in; yet none of his comrades, although sleeping alongside of him, would show any symptoms of the disease."

About 40 miles farther in the Kumaun Hills from Nainital is the sanitarium and military cantonment of Almorah. Here cholera appeared on the 25th April, and was also prevalent in the surrounding villages; from that date to the 5th July 166 cases and 126 deaths from cholera were registered. In the Native regiment and the jail there were altogether two cases, one in July and the other in August. Regarding the appearance of cholera in the Kumaun districts it is recorded—

"We have correct data as yet only regarding those pilgrims who went from the villages at the foot of the hills. The Hardwar Fair was over on the 12th April, and pilgrims from the villages near Kaladungi and Haldwani reached their houses on the 19th idem. Some died the day they arrived; others communicated the disease to their friends, without suffering themselves. This has been clearly proved in several instances. In one case a woman, on her return to a village about 3 miles from Haldwani, went to her brother's house; he was taken ill almost immediately after; he died. His son, mother, and two wives died within a few days, while the woman who brought the disease escaped altogether. Within a few days the cholera spread, and, exclusive of those who were buried or burnt by passing pilgrims, not less than 500 died in Kota Chakhata. Of these, 307 died in the villages between Kaladungi and the Sukhi River (about 15 miles). While the cholera was carrying off forty or fifty a day, travellers appeared to pass with impunity. Very few from these Bhaber villages went to Hardwar, and of the 307 who died about 30 only were pilgrims."

In the Tárai district, immediately at the foot of the Kumaun Hills, the cholera, which, as has been before mentioned, was prevalent in the earlier

part of the year, was, it is stated, "rapidly disappearing, when the return of the pilgrims caused it to break out afresh on all sides. The villages which suffered most were those close to the direct line of road to Hardwar, and it was in villages so situated that the disease first appeared. Many villages removed some distance from this line of road had not a single case of cholera, while others were decimated, and in one case the village has entirely broken up." The disease continued about forty days; there were 1113 seizures and 596 deaths.

In the Bareilly district, which immediately adjoins the Tárai, the first case of cholera was observed on the 18th April. The disease was attributed to importation by Hardwar pilgrims; "it was almost entirely confined to the lines of road along which they travelled, and to places to which people who had been to the fair returned." Between the 18th April and 27th May 552 cases and 63 deaths were reported from cholera. The prisoners and Native troops at Bareilly escaped altogether. Among the European troops there were 3 cases, viz., 1 in May, 1 in July, and 1 in August; and of these 2 died.

In the Budaun district, adjoining that of Bareilly, there was little cholera, and the stream of pilgrims was not large. The disease first appeared on the 18th April, when 3 deaths were reported in two widely separated places. In Budaun station the first cases, 2 in number, occurred on the 21st April. Up to the 4th May the disease was confined solely to pilgrims, and not a single resident was attacked. Up to the 11th May 151 cases and 14 deaths were reported.

The Sháhjahánpur district lies south-east of Bareilly, and suffered longer and more severely from cholera than any other district of Rohilkhand. The first case was observed on the 24th April, among pilgrims from Hardwar; up to September "nearly 3000 persons had died of the disease, or about one-half of those attacked." In the jail there were 22 cases, with 6 deaths; of which 1 was in May, 3 in July, and 18 in August. This was one of the few jails in the North-Western Provinces which suffered from cholera in 1867. The troops, both European and Native, also suffered. Among the Native soldiers, strength 200, there were only 5 cases. Among the European troops, consisting of the headquarters of H.M.'s 36th Regiment, the disease was more severely active. The first case occurred suddenly on the 8th May, when a woman belonging to the regiment was attacked. No other case occurred for more than two months, although the disease was raging among the natives in the city. Towards the end of July a second case occurred, and on the 8th August a third. On the occurrence of the first two cases the affected barracks were at once vacated for cleansing, fumigating, &c., and the inmates removed under canvas in the vicinity. On the occurrence of the third case the headquarters and three companies were marched into camp, 5 miles distant to the south-west, on the evening of the 9th August.

The weather had been very unsettled for some time, and a large portion of the country was inundated, and there was heavy rain again, with thunder and lightning, on the 13th August.

Whilst in camp single cases occurred on the 11th, 15th, 22d, and 25th August, and the last on the 2d September. The party left behind in Sháhjahánpur consisted of two companies, the married families and sick in hospital. On the 14th August these also were moved out to one of the regular cholera camps at Peina, 2½ miles north of the station, owing to the

occurrence of three cases of cholera, all eventually fatal. These cases were left behind in hospital. "Immediately on arrival in camp another fatal case occurred, and on the following morning 'a broken-down old soldier, who had been a long time in hospital, died with symptoms of collapse.'" On the evening of the 16th August camp was changed, and during the march of 3½ miles to the new ground a woman was seized with cholera, and died on the 17th; at the same time the hospital orderly, who had been in constant attendance on the cholera cases, was attacked. On the 18th August there were 8 admissions, and consequently, on the 19th, ground was again changed; during the day 2 men, 1 woman, and 2 children were seized with cholera.

The state of the weather was such as to render further movement impossible till the 25th August; in the meantime four fresh cases of cholera occurred in camp. At the new ground "heavy rain again set in, and a neighbouring tank having overflowed its banks, a portion of the camp was nearly inundated."

On the morning of the 28th a very virulent case of cholera occurred; ground was again changed, and there the last case occurred on the 30th August. The detachment returned to quarters on the 13th September.

In the Meerut district the first case of cholera reported occurred on the 14th April, in a resident of the city. The first case seen by the civil surgeon occurred on the 16th April, in a Sepoy returning to his regiment at Agra from a visit to Hardwar. "Within the next twelve days cholera was reported from 30 out of 33 police stations in the district." In April 736 cases, with 162 deaths, were reported; in May 2903 cases (all residents) and 916 deaths; in June 795 cases and 332 deaths. "Of the 30 police stations above referred to, cholera manifested itself at 10, among pilgrims and residents; on the same day at 16 other stations it appeared among the residents three days on an average after the arrival there of pilgrims suffering from cholera. At one station the residents escaped for twelve days, and at three other places no residents were attacked at all." The jail and the Native troops at Meerut escaped the disease throughout. The European troops escaped during the prevalence of the epidemic; but as this was subsiding, suddenly, on the 15th August, the first case of cholera occurred among them "without its advent being ushered in by any preliminary cases of bowel complaint." The disease disappeared entirely on the 25th September. "It spared neither age, sex, nor temperament, but attacked all indiscriminately." The troops, with women and children and sick in hospital, were speedily moved into camp, and the ground was repeatedly changed as fresh cases occurred. Between the 15th August and 25th September the first battalion of the Buffs lost 1 officer, 105 men, 12 women, and 20 children; in all 138, inclusive of 3 cases of choleraic diarrhœa. "The total number of cases of cholera treated was 155, and of these only 22 survived, which gives the appalling mortality of 85.7 per cent.—perhaps the highest death-rate from the disease that has ever yet been reached. The regiment was more than decimated." In the Royal Artillery there were 5 cases among the men, all fatal; and 5 children also fell victims. In the 19th Hussars no case occurred until the 8th of September, when a man in hospital under treatment for contusion was seized, and died; and on the 20th a woman was also carried off.

In the Bulandshahr district cholera was first observed on the 19th April, among pilgrims arrived from Hardwar; up to the 29th, out of 16 pilgrims attacked at Gulasti, 13 died. The disease does not appear to have prevailed with much violence in this district; "for, firstly, out of hundreds reported

to have been attacked, few cases of deaths in comparison occurred; and, secondly, despite the number of places in which reported cholera subsequently occurred, the pestilence, instead of spreading, has daily subsided."

In the Aligarh district the first case of cholera observed occurred on the 20th April, in a cartman who was attacked by cholera in the Koel market-place, and died after a few hours' illness; he had come from a village about 10 miles distant; "he had not been to Hardwar, nor had any of his relations or neighbours been there, and no cases of cholera had previously occurred in the village from which he came." Two more cases of cholera occurred in Koel on the 23d and 24th; "neither of the parties attacked had been to Hardwar, nor had they associated with persons coming from Hardwar, or from any other infected locality." On the same dates cholera was reported at Somma, a police station 14 miles distant from Aligarh, on the Delhi road; 2 cases occurred there on the 23d, and 1 each on the 26th, 27th, 28th, and 30th. "All the persons who suffered at Somma had been to Hardwar, or had travelled with pilgrims who were returning from Hardwar and who afterwards had cholera." Thus, of 22 persons who were attacked with cholera in this district between the 20th and 30th April, 7 had either been to Hardwar or travelled with pilgrims from Hardwar, and 15 had not. It is clear, from the above evidence, that in the Aligarh district, at least, cholera originated spontaneously, as it does in ordinary cholera seasons. In April 22 cases and 14 deaths were reported, in May 538 cases and 139 deaths, in June 71 cases and 29 deaths; total, 631 cases and 182 deaths. Among 450 Sepoys there was but 1 case, in April. In the jail there was only 1 prisoner attacked, in December.

In the Agra, Etawah, Muttra, and Farukhabad districts cholera prevailed but slightly, and apparently independently of the pilgrims from Hardwar. The outbreak at Agra in November 1866 has been referred to on a previous page. Regarding the prevalence of cholera in the early part of 1867 in these districts there is no precise information, but "most of the reporters from this part of the country state that cases had occurred now and then during the months of March and April." In the Etah and Mainpuri districts the mortality from cholera is said to have been considerable. Among the prisoners and troops at the station of Agra, numbering altogether about 3500 persons, only 2 cases of cholera occurred throughout the year, both among Native soldiers. But at the Secundra Orphanage, 5½ miles from Agra, an outbreak of cholera suddenly occurred on the 30th May, and continued until the 6th June. Out of a total strength of 456 Native Christians, 46 were attacked and 13 died. The first 28 cases were solely from amongst the big girls, who had been exposed to the rain. The civil surgeon observes—"Possibly, had I kept the small girls separate, they might have remained free from the disease, as the boys did—not one boy was attacked." He writes also—

"On the evening of the 29th May the girls had been out for their usual constitutional walk. When returning, and within the compound of the Orphanage, a sudden shower of rain fell; the younger girls, being close to their dwelling, at once escaped; but the elder girls, having to go about a hundred yards farther, got more or less wet. Next morning, about half-past four o'clock, one of the elder girls was found lying moribund in the court attached to the sleeping verandah, with all the appearances of cholera morbus. She died in an hour and a half; and from that time the disease spread with great rapidity."

In the Native State of Bhurtpur, immediately to the west of Agra, cholera, as has been stated in a previous passage, was actively prevalent in the autumn of 1866. The disease appears to have lingered on through the

cold weather months, and to have recommenced activity early in April 1867. On the 6th April a fresh outbreak of cholera was officially reported to have commenced; the disease spread with rapidity throughout the whole state, and by the beginning of May was prevalent in every district; in the city of Bhurtpur, where the disease was most severe, the total number of deaths was estimated at 255. Here again the outbreak of cholera early in April was independent of, and indeed antecedent to, that at the Hardwar Fair.

Regarding cholera in the Native State of Gwalior no precise information is available. It is stated—

"Cases now and again appear at all times and seasons in this part of the country, so much so that the inhabitants of the cities and villages are said to look upon the disease as a more or less constant visitor."

The first cholera death recorded at Gwalior occurred on the 22d May in the Lashkar suburb of the city, which is 5 miles distant from the British cantonment of Morar, and up to the 31st May only 5 deaths were reported, the city remaining free. Towards the end of May some cases occurred in two villages at opposite extremes of the cantonment limits, and shortly afterwards in the Sadr bazar, and later on in the city of Gwalior. In June the disease was actively prevalent, abated somewhat in July, revived again in August, and finally subsided in September. In the Sadr bazar and the two villages bordering on the cantonment there were in all 113 cases and 59 deaths reported between the end of May and the middle of September; in the Lashkar suburb of Gwalior there were 41 deaths reported, the first on 22d May, the last on 22d August; in the city of Gwalior there were in all 60 deaths reported, the first on 7th June, the last on 13th September.

The first case among the European troops in the Morar cantonment occurred on the 31st May, on which date the 103d Royal Bombay Fusiliers suddenly lost a man. The next cases occurred on the 11th and 12th June, the victims being two boys, sons of one of the privates, who both died. No other case occurred until the 10th July, when a patient in the hospital of the 103d Regiment was attacked; he died the next day. On the 13th and the 15th there were two cases in the barracks, one of which proved fatal in eleven hours. On the evening of the 15th the regiment was moved into camp at Girgaon, 3½ miles distant north-east from cantonments. Only one case of choleraic diarrhœa occurred in camp, and the regiment returned to quarters on the 25th July. On the 12th August a fatal case occurred in the Royal Horse Artillery; on the 14th a patient in the 103d hospital was attacked with choleraic diarrhœa; on the 17th a private of the same regiment was attacked with cholera; on the 20th another patient in hospital showed symptoms of choleraic diarrhœa; on the 23d another patient was attacked with slighter symptoms; and on the 24th a delicate child of the bandmaster died of choleraic diarrhœa. These were the last cases of the kind in the 103d Regiment. In the Artillery, after the first case on the 12th August, no other occurred till the 23d, when another case occurred simultaneously with the last case in the 103d Regiment. On the 29th August two more cases occurred, one in barracks, and the other in hospital. The battery and sick were moved out under canvas. On the 4th September a fatal case occurred in an ophthalmic patient who had been left behind in one of the small hospital wards. On the 8th there was a case of choleraic diarrhœa, and on the 11th a fatal case of cholera. Thus between the 31st May and 12th September the 103d Regiment had 5 cases and 3 deaths, and the Royal Artillery 6 cases, all fatal; all these cases appeared quite distinct from each other. Among the Native troops, comprising two regiments of infantry and

one of cavalry, there were only two cases, one in each of the infantry regiments, which were at extreme opposite ends of the cantonments, one being quartered on the extreme right, the other on the extreme left of the station.

In the fort of Gwalior the garrison was composed of a detachment of the 103d Regiment, consisting of 6 officers, 217 men, 39 women, and 73 children, on the 19th July 1867. Although the fort is situated between the populous Native city of Gwalior and its more populous Lashkar suburb, and free communication was maintained, no case of cholera occurred among the garrison until the 19th July, when a patient in hospital under treatment for syphilis was attacked with cholera. He recovered. Again no other case occurred until the 14th August, on which date a sergeant, who had just returned from leave to Morar, was attacked and died in a few hours. On the 16th cholera appeared among the married families in No. 3 barrack, and two children died. On the 17th a woman was seized; she died on the 22d. On the 19th a girl was seized; she recovered. On the 23d there were 2 more cases in No. 3 barrack, and during the next five days, except the 27th August, there was a case each day. Of these 5 cases, 3 occurred in hospital, 1 in camp, and 1 in the staff quarters. On the 6th September an overseer of the Public Works Department living in the fort was attacked and died.

In the Native State of Jeypur, to the south-west of Bhurtpur, cholera was more or less generally prevalent from early in April until the latter part of October. Throughout the state 739 deaths were reported, of which 428 occurred in the capital.

In Rajputana cholera was prevalent about Ajmir from early in July to the end of September. During this period 247 seizures and 65 deaths were reported.

The Central Provinces enjoyed, as we have seen, a remarkable immunity from cholera in 1867.

In the Allahabad district the first case of cholera was reported on the 24th April, but the disease had before this broken out in the jail at Allahabad on the 22d of March. In this jail the outbreak lasted until the 4th April, and between these two dates there occurred 27 cases, with 4 deaths. At the end of April the disease broke out in the Ghorpur village, about 8 miles west of the central jail, and up to the 7th May there were 27 cases and 19 deaths in this village. From this date the disease spread westwards, and was mostly confined to the Bandelkhand soils to the south of the Jumna River. On the 28th July cholera appeared among the European troops at Allahabad, the first case being that of an officer in the Chatham lines, who was suffering from dysenteric diarrhœa, and sank rapidly. On the next day a woman of the 107th Regiment, in an adjoining barrack, was attacked, as was also a man of the same corps. The wing of the 107th in Chatham lines was marched into camp on the 30th, and no other case occurred in it till the 8th August, when the disease again broke out. Camp was shifted on the 12th, and no further case occurring, the wing returned to its quarters on the 20th August. The wing of the 107th Regiment in the Clydesdale lines was attacked with cholera on the 1st August, and 5 cases, with 2 deaths, occurred up to the 6th. The wing, including headquarters, was marched into camp 4 miles off, but 7 men and a child were attacked there between the 8th and the 12th. On the latter date camp was shifted, but 5 fresh cases occurred next day on the new ground. No other case occurred here until the 26th, when, as the detachment was about to return to barracks, 2 fresh cases occurred—one a married man whose child had already died of cholera, the

other a bandsman who had been encamped close to the married people. The detachment, with the exception of the married people, was moved that day into barracks, and 1 case was admitted on the day of the return to barracks; and this was the last that occurred. The married people returned to cantonments on the 29th August. On the 7th August 1 case, which recovered, occurred in the detachment of the 107th in the fort. The first case in the Artillery occurred on the 6th August, and up to the 9th there were 5 cases—3 men and 2 children. The entire Artillery division was then moved into camp 4 miles out, and no other case occurring, they returned to quarters on the 30th August. It is recorded that—

"Nearly one-half of those attacked with cholera in both corps had been men of intemperate habits. The weather during the outbreak was seasonable. The heat was never excessive; there were fresh easterly breezes, and the rainfall was moderate."

In the Banda district cholera was first observed on 12th May, and afterwards the disease broke out in three different places widely separated from each other. As facts opposed to the theory of the spread of cholera by contagion, it is instanced that two villages suffered severely from cholera, whilst an intervening one escaped; also that in some small villages individual cases of cholera occurred, and yet no epidemic broke out.

The Fatehpur district almost entirely escaped cholera, but in the Cawnpore district the disease prevailed with severity, 1816 deaths having been attributed to it. A few cases occurred in the cantonment also—1 among Native troops in June, and 3 among the European troops, viz., 1 in May and 2 in July.

Regarding cholera in the Oudh districts there is no detailed information available. The disease is reported to have been very prevalent during the months of February and March all along the Himalayan Tarái, skirting the northern part of Oudh and also of Gorakhpur. On the 27th March cholera appeared in the central jail at Lucknow, and nearly at the same time in the lunatic asylum. In the jail, strength 1765, there were 11 cases and only 1 death. The jails of Oudh were generally exempt from cholera in this year, and none suffered severely except that at Sitapur, in which there was a severe outbreak, with 50 seizures and 13 deaths, between the 15th August and 1st September.

In the districts of Bahraich, Fyzabad, and Sitapur cholera was officially reported as epidemic in April; in Rae Bareli it was not so severe; both in Unao and Partabgarh it broke out in May, and again in September. In the district and city of Lucknow the disease was for a time very rife and persistent nearly throughout the year; the deaths recorded are 2 in March, 3 in April, 15 in May, and in August the number had reached 1396; in December the number fell to 29. In the Hardoi district an epidemic outbreak occurred in the town of Sandila during July and August, and was attributed to defective drainage and flooding from three tanks that "had overflowed and carried a quantity of putrid animal and vegetable matters over a part of the town."

The first case of cholera among the European troops in Oudh occurred at Fyzabad on the 28th April; 3 men, 3 women, and 3 children fell victims to the disease. There had been a succession of dust and thunder storms, with occasional rain, commencing on the 12th April, which considerably lowered the temperature until the 24th of that month. At Sitapur there were 8 cases among the European troops, 4 in August and 4 in September. At Lucknow, strength 2535, there were only 11 cases. Among the Native troops there

were only 8 cases, viz., 5 at Lucknow, of which 2 were in June and 3 in July, and 3 at Sitapur, of which 2 occurred in August and 1 in September; of these 8 cases 7 were fatal.

In the Benares district cholera does not appear to have been severely prevalent. The central jail and the European troops had no cholera throughout the year, and only 4 cases occurred among the Native troops, viz., 3 in March and 1 in May. The first case observed in the city was on the 23d March, "in one of the dirtiest, worst-drained, and most thickly populated parts."

In the Basti district cholera was widely spread, and was most severe in its northern parts. In Gorakhpur also the disease was very prevalent. In the adjoining Native State of Nepal cases of cholera occurred at Khatmandu from about the middle of April to the middle of May; but they were few, and created no alarm. Towards the end of May the disease was raging in the town of Gorkha, about 60 miles west of the Nepal Valley, and about the same time cholera became more frequent in Khatmandu. By the 18th June the disease was fairly established, and continued till the end of September, and caused a mortality estimated at 2500 deaths. It has been stated in a previous place that cholera affected the Nepal troops marching along the Tarái skirts in January of this year; but the disease had ceased among them entirely before the return of Sir Jang Bahadur's party to Nepal, and no cases occurred in the valley at that time.

Regarding the meteorology of the year 1867 in these provinces some valuable information is recorded in the Report of Dr. Murray Thompson. In the remarks on "the table showing some mean results of observations at Rurki" during the years 1863 to 1867 inclusive, it is stated, among other things, that—

> The year 1867 had the largest rainfall, and the greatest number of days on which it fell, of any of the years, and that it had also the lowest mean maximum or day temperature, but that, notwithstanding these, it had also the lowest mean humidity. East and south-easterly winds were more prevalent than any others at Rurki during all the five years.

In the remarks on a similar table of observations at Agra for the same years (these tables are given in the Fourth Annual Report of the Sanitary Commissioner with the Government of India) it is stated that—

> The relation of the relative humidity to the rainfall of 1866 and 1867 is the point which chiefly calls for attention, "these in both cases being the very opposite to what might have been expected. In 1866 there was high humidity, with a very low rainfall, these being respectively the highest and lowest recorded in the table. In 1867 the reverse of this was the case; the second lowest humidity occurs with the highest rainfall, and the number of days in which rain fell being strikingly in excess of any other year. The humidity columns of 1866 also show that the highest mean humidity at 10 A.M. took place in October, which was an almost rainless month, ·08 of an inch falling on the 12th; and no other rainfall whatever was recorded. The prevalence of north-east, east, and south-east winds in 1867, as compared with previous years, is remarkable."

In the remarks on the corresponding table of observations at Benares it is stated that—

> There is no exception to the normal relation of the humidity and the rainfall. The rainfall in 1867 is shown to have been 8·63 inches in excess of the average of four years, and the number of days on which it fell to have exceeded the same average by eight days. The mean humidity in 1867 exceeded the average of the same period by 5 at 10 A.M. and by 6 at 4 P.M. The lowest monthly mean humidity occurred in March, and at 10 A.M. was 5, and at 4 P.M. 3, above the average of four years. The highest monthly

mean at 10 A.M. occurred in July, and was 2 above the same average; at 4 P.M. it occurred in August and September, and was 2 below the same average.

With regard to the rains of this year it is recorded—

"The rains of 1867 came on with a great uniformity. Within a period of four or five days they had appeared all over the North-Western Provinces, but their disappearance was not so uniform. In the higher, more northern, and western districts there was no rainfall after the first week in September, but in the more eastern and southern tract they continued, though with many considerable breaks, well into October. In many more places, although there was no actual rainfall, yet those characteristics of the season, a cloudy sky and a high relative humidity of the air, yet remained, and these did not disappear till beyond the middle of October."

With respect to the food-supply, it is stated that both in Oudh and the North-Western Provinces the prices of food, though somewhat lower than in the preceding year, still continued high during 1867. Prices had been steadily rising during some years preceding, and in 1866 were largely affected by the extensive exportations of grain to the famine districts of Bengal. Upon the poorer classes these high prices, there is no doubt, pressed with considerable severity in many parts both of Oudh and the North-Western Provinces.

1868.—Cholera subsided to a minimum of prevalence in this year, as was normally due in the periodic course of the disease in this cycle. The death-rate from the disease among the troops and jails together was 0.51 per mille of strength, and it was at the same rate among the civil population also. This subsidence in the prevalence of the cholera of 1868 in these provinces was coincident with a very remarkable deficiency in the rainfall of the year, producing a season of exceptionally severe drought. The rainfall of 1868 was nearly 26 inches less than that of the preceding year, and it was also nearly 13¼ inches less than the average. The defect in 1868 was distributed over the last three quarters of the year, and was most marked in the third quarter (see Table No. V.); in the first quarter the fall was unusually plentiful for that season, and was apparently a continuation of the excessively abundant rainfall of the preceding year. The prices of food in 1868 differed but little from those holding in 1867, but the difference was in the direction of higher rates.

Among the European troops, total average strength 12,984, there were altogether 23 admissions and 10 deaths from cholera, giving a death-rate of 0.80 per mille of strength. Of the 22 stations occupied by these European troops, the 7 following recorded cholera in 1868, viz.:—Benares, strength 663, admissions 2 and deaths 1; Lucknow, 2215, 9 and 7; Cawnpore, 722, 3 and 0; Allahabad, 910, 2 and 2; Meerut, 1616, 2 and 0; Agra, 908, 3 and 0; and Morar, 784, 2 and 0 respectively. Of the 23 admissions, there were 2 April, 1 in June, 14 in August, 4 in September, and 2 in December. Among the families of the European soldiers, total average strength 1431 women and 2370 children, there were altogether 3 deaths from cholera in 1868, viz., at Lucknow, 1 woman in a strength of 280, and 2 children in a strength of 402, and at Benares, 1 child in a strength of 121 children.

In this year the registration of deaths was for the first time extended to the Oudh districts; and the deaths registered in them from cholera are incorporated with those registered in the North-Western Provinces; these deaths are given by districts for the year only, and not by months, and the year comprises the last nine months of 1868 and the first three of 1869 (see Tables Nos. I. and II.) Of the total 20,910 deaths registered from cholera

in 1868, the districts of Oudh (Kheri to Fyzabad in Table No. I.) returned 5619, or at the rate of 0.50 per mille of population; the remaining deaths were returned by the districts of the North-Western Provinces, and give a death-rate of 0.61 per mille of population. In the North-Western Provinces the cholera of 1868 is shown by the returns to have been epidemically prevalent only in the districts which border on Bengal, namely, in those of the Benares division. In these districts the disease is endemic, being never entirely absent at any time of the year. The deaths from cholera in 1868 are returned from nearly all the districts, but the disease was not generally prevalent anywhere above Allahabad. The returns, however, show that deaths from cholera occur at all times of the year in almost every district; the disease, it appears, is endemic everywhere in the province, but is less usually epidemic above Allahabad. The monthly returns show that in these provinces cholera increases in the hot dry season, and that the rains favour the increase.

Regarding the meteorology of the year in the North-West Provinces, it is stated that in the first three months of 1868—

"There was a tendency to higher air-pressures, higher humidity, and rainfalls in the upper division of the North-Western Provinces, as represented by Rurki; but these characteristics were not noticed at Agra, while at Benares, as far as air-pressure was concerned, it was rather lower than in former years. In the dry and hot months of April and May there was again slightly higher air-pressures in the upper division, but in the southern and eastern the tendency was rather to a lower barometer. In other respects this part of 1868 was not unlike the corresponding period of former years. It was in the rainy season that 1868 differed more especially from other years, not so much, however, in the early half of this season comprised in June and July, for this, excepting that it had rather a long dry period, extending from the 18th or 20th June on to near the middle of July, and in which the wind was often westerly and hot, was not far behind the same periods in previous years in point of rainfall, temperature, and other features of the weather peculiar to the rains. It was in August and September when the difference was most seen; in these the rainfall was very deficient, the mean temperature high, and the wind was westerly, instead of easterly or south-easterly, or a calm altogether. The rains were more normal, and that uniformly through the four months June, July, August, and September, in the eastern districts than in the western or north-western. In October, although the humidity was still a little lower than usual and the temperature higher than usual, yet the weather was much like that observed in the Octobers of former years. The later cold weather months, November and December, were a very little drier and warmer than in other years, but generally the weather was much as usual." (Sanitary Report for the North-Western Provinces for 1868, by Dr. C. Planck, Sanitary Commissioner.)

1869.—In this year, the first of the triennial cycle 1869–71, cholera prevailed with a very marked revival of epidemic activity. Among the troops and jails together the death-rate from this disease rose to 7.24 per mille of strength against 0.51 in 1868, and among the civil population to 2.28 per mille against 0.51 in 1868. In the North-Western Provinces the total cholera deaths registered in 1869 amounted to 69,542 against 15,291 in the preceding year. For Oudh the corresponding figures are 23,134 and 5619 respectively; the death-rate per mille of population being 2.30 for the North-Western Provinces against 0.61 in 1868, and 2.07 against 0.50 respectively for Oudh.

In the North-Western Provinces the returns show that, whilst 54 deaths from cholera are reported from Kumaun, the other hill district of Garhwál and the Tarái adjoining return no death at all from the disease, and Dehra Dun, also at the foot of the hills, but a single death. From Bijnor, the nearest district to these on the plains, the number of deaths returned from

cholera is only 68, and in the other northern districts of the province the mortality is very markedly lower than that in the southern districts. The returns show cholera present in the beginning of the year in many of the districts both in the southern and northern parts of the province, but the disease attained its period of maximum prevalence earlier in the southern than in the northern districts; in the former the heaviest mortality was registered in the months of June, July, and August, and in the latter during August, September, and October.

In the south-eastern districts, from Ghazipur to Allahabad, cholera was present throughout the year; increased in prevalence more or less rapidly in the different districts up to April; after this there was a decided rise towards the maximum intensity of the year, which was attained in the different districts between the months of May and August; in September there was a general abatement, and the disease continued to subside steadily to a minimum in November and December, with a slightly marked tendency to a revival of activity in some of the districts at the close of the year. In the south-western districts, from Fatehpur to Lalitpur, cholera was generally later in appearance—in Fatehpur in the end of February, and in Lalitpur not till May, and in the intervening districts during March and April. In these districts the disease everywhere declined in prevalence during October, and subsided entirely in November, no death from cholera being reported from any of this group of districts during December. This is in marked contrast to the deportment of the disease in this same month in the south-eastern districts, in which cholera is held to be endemic, owing to its never being entirely absent from the area covered by them.

In the more northerly districts, from Cawnpore to Meerut, the returns show cholera to have been present in almost all the thirteen districts during every month of the year, though the disease did not attain its general epidemic activity until August. In Cawnpore, Agra, and Muttra, however, the epidemic activity commenced in June. In November there was a general abatement in the epidemic prevalence of the disease, and in December it everywhere subsided to a minimum of prevalence, or, as in Cawnpore and Farukhabad, ceased entirely.

Regarding the peculiar meteorological phenomena happening at places where cholera was epidemic, the following particulars are recorded:—In Bulandshahr district heavy falls of rain, and during the intervals of rain cholera increased. In Farukhabad ozone was noticed to be deficient; rain commenced on the 1st July, and cholera on the 5th; rain ceased on the 10th October, and cholera on the 31st; cholera did not appear anywhere until after the rain had fallen. In Banda the temperature averaged ten degrees higher than usual in May and June, and the rains were heavy; but cholera did not appear to be influenced by wind or weather. In Ghazipur the weather is described as unbearably hot, damp, and depressing, with east wind in the cholera time. In Budaun cholera became epidemic after the rainfall of 11th and 12th August; no more rain fell, and cholera increased up to 28th August, when rain again fell, and cholera declined. In Hamirpur cessation of rain seemed to cause increase of cholera.

As regards the peculiarities of the soil favouring cholera, it is recorded that in Farukhabad and Jalaun, on low ground, sometimes inundated, and the soil retentive of moisture, cholera prevailed most; on the other hand, in Mirzapur cholera prevailed for a month in the village of Akhori, which is situated on a hillock of sandstone, "and has a site as dry as stone can make

it," and caused a mortality among its inhabitants at the rate of 15.70 per mille, while the inhabitants of surrounding villages on lower ground escaped altogether.

Dr. C. Planck, the Sanitary Commissioner for the North-Western Provinces, furnishes with his Annual Report an interesting statement showing the mortality from cholera during 1869 in the police force of 16 districts in which cholera was most prevalent. The results are briefly as follows:—The aggregate strength of the police force of the 16 districts concerned was 14,262, the number of deaths from cholera 35, and the death-rate 2.40 per mille of strength. The aggregate population of the same 16 districts was 14,588,821, the number of deaths recorded from cholera 49,997, and the death-rate 3.42 per mille of population. In 8 of the 16 districts no cholera occurred in their police force. The results, as Dr. Planck observes, speak well for the district registration, though probably the actual difference in the death-rates was somewhat greater on the side of the general population, which included a large number of poor and destitute people, whose condition in respect to liability to cholera was far more unfavourable than that of the better housed, clad, and fed police constables.

With regard to the meteorology of the year in the North-Western Provinces, it is stated that—

"The year 1869 was essentially an unhealthy year in these provinces, a year in which the three principal causes of death amongst its people, namely, fever, smallpox, and cholera, were very prevalent. Its remarkable features, as regards climate, were a lengthened hot season—a dry, ardent season—commencing early, and extending far into what is usually counted as the rainy season; a delayed rainy season, characterised by a rainfall of more than average quantity, and ending in quite a flood of rain, as late as the first ten days of October."

The unusual heat of the months of May and June 1869 is shown in the annexed table of temperatures during these months for the three years 1867, 1868, and 1869, compiled from Dr. Murray Thompson's weather reports:—

Years.	Maximum in Sun's Rays.		Minimum on Grass.		Maximum in Shade.		Minimum in Shade.		Mean in Shade.	
	May.	June.	May.	June.	May.	June.	May.	June.	May.	June.
1867	130	128	66	76	105	102	74	79	91	90
1868	133	122	64	77	103	101	75	81	91	91
1869	164	154	74	78	109	106	82	83	94	95

A reference to Table No. II. shows that the cholera of 1869 in the North-Western Provinces (exclusive of Oudh, the monthly distribution of the cholera mortality registered in these districts in 1869 not being available) broke into epidemic activity with considerable violence in March, the mortality suddenly rising up to 1681 deaths in that month from the spring minimum of 358 deaths, to which the mortality had fallen in February. The epidemic steadily advanced month by month with greater or less bounds, and finally attained its climax in August. In September there was a very

sudden and marked fall in the mortality, namely, to 7594 deaths from 22,837, the culminating number attained in the preceding month; and the disease continued to abate rapidly during the succeeding months, and the mortality finally subsided to 397 deaths in December. This fresh epidemic activity of the cholera of 1869 in these provinces was coincident with a comparatively very copious rainfall coming in succession to a season of unusually prolonged and severe drought (see Table No. V.), for the rainfall of this year, though somewhat below the average, was 11½ inches above that of 1868; it was coincident, also, with a season of severe distress for food, the year 1869 being one of famine in the North-Western Provinces.

1870.—In this year cholera abated greatly, and with a rapid tendency to complete subsidence. Among the troops and jails together the death-rate from the disease fell to 0.93 per mille of strength against 7.24 in 1869, and among the civil population to 0.70 per mille against 2.28 in 1869. This marked subsidence in the prevalence of cholera in 1870 was coincident with a continuance of abundant rainfall and a considerable cheapening in the prices of food (see Table No. V.)

In this year, for the first time, the deaths registered from cholera in the Oudh districts are distributed according to their occurrence by months, and in Table No. II. are incorporated with the deaths registered monthly in the North-Western Provinces. The total number of deaths registered from cholera in 1870 in the North-Western Provinces amounted to 13,123, or at the rate of 0.44 per mille of population, and in Oudh to 15,318, or at the rate of 1.37 per mille of population.

In the North-Western Provinces the cholera of 1870 prevailed as an epidemic only in the districts of Gorakhpur and Basti, and they are one country across the Gogra River, conterminous with the Saran district of Bengal eastward and the Gonda district of Oudh westward. The disease was also somewhat prevalent in the districts of Azamgarh, Mirzapur, Benares, and Ghazipur, to the north of the Gogra. The districts of Jhánsi, Lalitpur, and Tarái show a complete exemption from the disease; and those of Jalaun, Kumaun, Garhwál, Dehra Dun, Hamirpur, and Fatehpur return cholera deaths under and up to ten. In most of the northern districts cholera prevailed but slightly in comparison with the preceding year.

The seasonal rise and fall in the prevalence of the disease is shown in Table No. II. The figures show that the cholera of 1870 (Oudh and North-Western Provinces together) ran a somewhat different course to that observed (North-Western Provinces only) in the preceding year. In 1869 the disease, after subsiding to a minimum in February, suddenly burst out into epidemic activity in March, and steadily increasing, attained its climax in August. In September the epidemic began rapidly to abate, and this abatement continued steadily to the close of the year, and finally sank to the minimum of prevalence in January 1870. In 1870, after this subsidence in January, cholera recommenced epidemic activity in February, but with no great initial violence. In March activity was more pronounced, and steadily increasing, attained the climax in May. During June and July there was a progressive abatement of the disease; but in August it renewed epidemic activity, and this continuing, another period of maximum prevalence was attained during October and November. Finally, in December the disease again began to abate, and rapidly sank to a minimum prevalence in February 1871.

In the Oudh Province cholera was reported from every district, but the disease was epidemic only in the districts of Sultanpur, Fyzabad, Gonda,

Sitapur, and Bahraich. In the Unao district there was scarcely any cholera in 1870; and it is stated that the disease was prevalent in this district in 1867, 1868, and 1869, and was more virulent and fatal in each succeeding year of the series. In 1870 cholera spread from district to district in regular order from Gonda to Sultanpur, as shown by the periods of greatest mortality, thus:—In Gonda cholera was most fatal in April and May; in Bahraich in May, June, and November; in Sitapur in August, September, and October; in Bara Banki in September, October, and November; in Fyzabad in October and November; and in Sultanpur in November and December.

In Gonda cholera appeared in January at Kamalpur, in the Colonelganj circle, and from March to July was prevalent everywhere in the district. In April the disease broke out among the concourse assembled at the Devi Patan Fair. The people immediately dispersed; "but the disease spread, and upwards of 2000 persons are reported to have died in this district during that month" from cholera.

In Bahraich district cholera of a virulent type broke out at Ranipur, 10 miles from Bahraich town, on the road to Colonelganj, in Gonda district, in the end of March or beginning of April, and continued to the end of the year. In Sitapur district cholera broke out in July, and continued to the end of the year. In Bara Banki, across the Gogra River, it appeared in March. In Fyzabad isolated cases of cholera were reported from the beginning of the year; but the disease broke out in March, and continued till the end of the year. "It appears, indeed, to have sprung up almost simultaneously in different directions, and in places as widely apart as Fyzabad and Tandah, distant from each other about 40 miles;" and "no part of the district appears to have altogether escaped." In Sultanpur cholera prevailed generally over the district during the whole year, breaking out here and there. "Its ravages were much more severe in villages bordering the river (Gumti) than in those at a distance from it. The mortality was only half what it was in 1869." The health officer of Sultanpur mentions that the bodies of about fifty people who died of cholera were thrown into the Gumti, at the village of Kotwali, about 24 miles above that station.

With the exception of the Jaunpur jail—strength 332, admissions 100, deaths 30—there was comparatively little cholera among the troops and jails in these provinces during 1870. The outbreak in the jail was of exceptional severity, and the disease appeared also unusually early in the year. The first case occurred on the 3d February, a second on the 6th, a third on the 8th, and on the 9th there were 10 cases. The disease now became prevalent, and 65 fresh cases occurred during the next five days. The last case occurred on the 23d February. In these twenty-one days there were 100 admissions and 30 deaths, giving a percentage of 30.12 admissions to strength, and 30 of deaths to admissions. In the opinion of the medical officer the facts of this outbreak "point to the presence of a cholera miasm, which was wafted by the winds, and rendered active under the influence of moisture."

The following tabulated statement of particulars of the meteorology of 1870, compared with the corresponding elements for 1869, are from the Rurki tables, prepared by Dr. Murray Thompson for the North-Western Provinces:—

Months.	Temperature. Means—										Mean Humidity.		Rainfall. Inches.	
	Max. in Sun's Rays.		Min. on Grass.		Max. in Shade.		Min. in Shade.		Mean in Shade.					
	1869	1870	1869	1870	1869	1870	1869	1870	1869	1870	1869	1870	1869	1870
January . .	118	121	37	36	74	74	46	44	61	61	48	46	...	...
February . .	129	128	47	42	80	81	52	50	67	68	42	42	...	...
March . . .	139	138	51	51	87	87	59	60	73	74	54	36	...	...
April . . .	154	147	60	60	102	97	69	66	86	82	25	31	...	...
May	164	152	74	68	109	109	82	77	95	93	28	23	...	...
June	154	147	78	76	106	102	83	80	94	90	40	43	1·3	7·4
July	145	138	76	75	93	93	78	77	86	85	68	73	11·5	14·4
August . . .	147	136	76	73	93	91	79	77	86	83	70	74	6·2	12·9
September . .	143	141	73	71	91	90	74	75	83	82	75	72	12·5	7·5
October . . .	136	135	58	62	87	91	64	68	76	80	58	53	4·3	2·0
November . .	130	132	42	45	82	84	50	51	67	69	46	44	...	...
December . .	121	124	39	39	76	76	47	40	62	60	57	48	...	...
													35·8	44·2

The figures show a very considerable difference between the temperatures and moisture of the two years, more especially in the months March to July inclusive. This is the more worthy of note as cholera was very prevalent and fatal during those months in the one year, and very little prevalent in the other. In the month of March 1869 cloudy, dull weather was the rule, and there was rain on the 6th, 7th, 14th, 15th, 20th, and 21st, whilst in the same month in 1870 the weather was bright at first, and afterwards cloudy, with slight rain, and the general moisture was much less. In other words, the season of 1869 was characterised by moist, cloudy weather in March, with "atmospheric vapour unusually plentiful," by remarkably hot months succeeding, and by delayed rains; a very trying year, and cholera epidemic. The season of 1870 was characterised by a comparatively clear March, moderate heat succeeding, early establishment of the rains; a very pleasant year, and cholera little prevalent.

The meteorology of Oudh is represented only by the observations recorded at Lucknow Observatory. In 1870 the mean temperature of the hot months was considerably lower than that of the same months in previous years. In the rainy months the amount of rainfall exceeded that of the previous year by upwards of 22 inches. The temperature of the winter months was pretty much the same as that of the previous year.

Regarding the food-supply, it is stated that, in comparison with the preceding year, the year 1870 was one of comparative plenty in the North-Western Provinces, but that, in comparison with the prices ruling during the previous ten years, it cannot be fairly considered even as a year of average plenty.

1871.—In this year, as was normally due in the third year of the cycle 1869–71, cholera abated still further, and subsided to a minimum of prevalence. The death-rate from the disease in 1871 among the civil population sank to 0.48 per mille against 0.70 in the preceding year. This subsidence of cholera activity in 1871 in these provinces was coincident with a continuance of plentiful rainfall and a very marked cheapness of food (see Table No. V.) There was no season of drought experienced since that in the last quarter of 1868, although the scanty fall in the last quarter of 1871 verged upon the production of drought.

The total of deaths registered in the North-Western Provinces during 1871 amounted to only 3473, or at the rate of 0.11 per mille of population. In Oudh the deaths were 13,123, and the death-rate 1.43 per mille of population.

The following particulars are from the Annual Sanitary Report for the North-Western Provinces for 1871 by Dr. C. Planck, the Sanitary Commissioner, from whose previous reports the particulars relating to cholera in the North-Western Provinces have been drawn in the account of the several preceding years, and whose subsequent reports also are the chief source of information on this subject.

In the North-Western Provinces the cholera mortality of 1871 was less than that of any previous year back to 1865, from which year the registration of deaths commences in these provinces. In 1871, except a sudden outburst of cholera towards the close of the rainy season in the eastern districts, where the people had suffered much privation in consequence of the overflow of the Gumti and Tonse Rivers, there was no epidemic prevalence of the disease in these provinces. Referring back to the annual returns for preceding years, it appears that no generally diffused cholera epidemic has occurred in these provinces to the northward of Cawnpore since the year 1867, whilst in the districts southwards of Cawnpore the disease prevailed generally as a severe epidemic in the years 1865 and 1869. The epidemic of the latter year, beginning in 1866 with small commencements in the Ghazipur and Mirzapur districts, in 1867 advanced northwards to the districts of Allahabad and Banda, and in 1868 involved all the southern districts except those in Bandelkhand, viz., Jalaun, Jhánsi, and Lalitpur, which remained completely free from the disease during the three years. Finally, in 1869 cholera burst out over all the southern districts in a manner very similar, as regards the mortality of the year, to the epidemic of 1865. In 1870 the epidemic of the preceding year in the southern districts had completely subsided everywhere except in the districts of Basti, Azamgarh, and Gorakhpur, where it still lingered; but in 1871 the disease had everywhere lost its epidemic character both in the northern and southern districts, Benares alone in this year showing a tendency towards a revived activity of the disease. In 1871, out of the 35 districts in the North-Western Provinces, 17 returned less than a total of 50 cholera deaths during the year, and 10 a total of less than and up to 100; Jaunpur district returned 300, Ghazipur 400, and Benares 700, the highest totals of all the districts.

In Oudh the cholera of 1871 was active during every month of the year, but most severely so in the last three; the disease was reported from every district, and in Sultanpur, Rae Bareli, and Fyzabad was prevalent throughout the year; but the heaviest mortality occurred during October, November, and December, the deaths registered in these three months being more than seven times as many as those in all the other months together. The Sultanpur district suffered most severely of all, the total cholera deaths registered being 5704, or 6.13 per mille of population; during the first nine months the mortality was about the same as in preceding years, but in October it increased with "alarming fatality," rising from 84 in September to 643 in October, 2400 in November, and 2221 in December. In this district the cholera of 1870 was also most fatal in November and December. Notwithstanding that cholera existed in nearly all the surrounding villages, only 11 deaths occurred in the Sadr station. The jail was entirely free from the disease, and the police, with the exception of two constables who were

attacked and recovered, enjoyed a similar immunity. The civil surgeon states that—

"Before the appearance of cholera the people had been weakened by exposure to cold and wet and repeated attacks of fever;" that "the loss of their wells obliged them to resort to the nearest tank for a supply of drinking-water, polluted by their own ablutions, and defiled by the fluid and solid excreta of buffaloes and other animals which are permitted to frequent those places;" and that "the practice exists of exhuming bodies of persons who die of cholera and are buried during the epidemic, the friends administering the funeral rites when the disease has left the place."

In Bara Banki no death from cholera was reported till May, after which the disease steadily rose to its maximum intensity during the last three months of the year. In 1870 the greatest mortality from cholera in this district also occurred at this late season of the year.

In Rae Bareli cholera was reported in every month of the year, but increased in prevalence in September, and continued till December, when it began to abate. On the 26th November several bathing fairs took place in this district, on the banks of the Ganges. The principal of these was at Dalamow, where 30,000 persons were assembled for two days. "There was not a single case of cholera reported at any of the fairs; and there has been no cholera at Dalamow since the fair at that place." The southern parts of the district escaped cholera altogether. It is remarked that—

The disease remained longest in localities surrounded by marshes and swamps, "and in low lands which had been submerged by the superabundant waters of the jhíls which they border, as are the majority of the villages of the northern parganahs, in which the devastation was greatest."

In Gonda district 73 deaths in all were registered from cholera during the year. The civil surgeon writes—

"I think it doubtful whether the disease really existed in the district. . . . In October cholera was again reported. . . . I visited the village, and found that the people were suffering from malarious fever of very bad type. While on tour last cold weather I was frequently told by the natives that there would be no cholera; they said it had lasted three years, and that it was finished. It is satisfactory to know that their prophecy was correct. In 1868, 1869, and 1870 cholera raged; in 1871 there was none. The three years' duration was also seen in Unao district. In 1867, 1868, and 1869 cholera existed; there was none in 1870."

In Partabgarh district a bathing fair was held on the 26th November at Manikpur, on the banks of the Ganges, when 125,000 people were assembled; no cholera occurred at the fair, and there was none in Manikpur up to the end of the year, though the disease was prevalent in the Partabgarh, Sultanpur, and Rae Bareli districts. The civil medical officer of Partabgarh, it is stated, found the water from 3 to 4 feet from the surface in wells of villages in which cholera existed, and the water was full of grass, weeds, and twigs.

It is recorded of Rae Bareli villages about Sallathu, Asui, &c.—"All villages more or less surrounded by jhíls, which had overflowed and poured their impure water not infrequently into the wells used for drinking purposes." Cholera broke out with force in October. The last rain, which was long continued and violent, and which ended about the 18th September, made the soil and the walls of the mud houses damp for several weeks after.

In Lucknow the subsoil water was high till the middle of November. "In the cemetery, which is in the centre of a part of the civil station where cholera committed great havoc among Europeans and Natives, it was noticed by the Rev. Mr. Moore that from 'the 9th to the 15th November the water rose in every grave so fast that it was with great difficulty a grave could be

made,' and the water was necessarily at an unusual height in the neighbouring wells."

The meteorological observations for the year 1871 in the North-Western Provinces were, as usual, recorded at fourteen specially selected stations, and tabulated at Rurki for publication in the *Provincial Gazette*. The following tabular statement of the results as regards temperature and moisture is prepared from the Rurki tables, in a form permitting of comparison with the figures of the two preceding years already given in the review of 1870:—

Year 1871.	Temperature. Means—					Humidity.	Rainfall. Inches.
	Max. in Sun's Rays.	Min. on Grass.	Max. in Shade.	Min. in Shade.	Mean in Shade.		
January	119	39	72	46	59	53	...
February	128	48	79	53	67	50	...
March	140	50	88	57	77	30	...
April	151	61	99	67	86	30	...
May	151	71	98	74	87	43	...
June	145	75	95	77	86	65	10·6
July	136	76	88	77	83	83	17·3
August	134	74	87	76	81	82	11·0
September	140	72	89	73	81	79	10·5
October	141	58	92	64	78	62	...
November	131	46	84	54	69	59	...
December	120	41	74	45	59	65	1·0
							50·4

Comparing the above figures with those given in the table for the preceding two years in the review of 1870, page 443, it will be seen that the peculiarity of the meteorology of the year 1871 is characterised by a larger rainfall, increased atmospheric moisture, and lower temperature generally. The climate of the year, considered as a whole, was unusually temperate. In the month of March, however, the atmosphere was unusually dry and the temperature above the average. This condition was continued in April, and dust storms were frequent in that month and in May. The rains commenced early in June, and were unusually continuous; indeed, June, July, August, and September were an almost continuously cloudy season, in which the sun was little seen.

During 1871 cholera was little prevalent in the North-Western Provinces, and nowhere epidemic, and the same may be said of 1870; but in 1869 the disease was very prevalent and fatal. The meteorological peculiarities of 1869, as compared with the two following years, were the high temperature of the sun's rays in that year, and the unusual atmospheric moisture in the month of March, followed by unusual dryness in April, May, and June.

The meteorology of Oudh is represented by the results recorded at the Lucknow Observatory. The following particulars are from the report by Dr. Bonavia, as given in the Sanitary Report for Oudh for 1871. Regarding temperature, it is stated that—

"The mean daily temperature in the shade for the whole year was 77.6°; the highest was 108.3° on the 30th April, and the lowest 39.1° on the 6th January. The mean temperature of May, June, and July was unusually low, and the mean temperature of November was unusually high. The highest temperature in the sun was 168° on the 9th June, while the mean sun heat for the year was 135.9°."

Regarding rainfall, it is stated that—

"The fall of rain during 1871 was unusually large, viz., 65 inches. The heaviest falls were in the months of May to September inclusive, but mostly in July and September. Between the 12th and 18th September it rained almost incessantly for about 140 hours; 20.14 inches fell in September, none in October or November, and only 2.10 inches in December."

The peculiarities of the meteorology of 1871 are described as—1st, a general absence of hot winds during their usual season; 2d, very heavy and continued rain in July and September, more so than in any previous Julys and Septembers; 3d, the mean temperature of the rainy months in 1871 was considerably below that of the same months in previous years, and the mean temperature of November 1871 was considerably higher than that of previous Novembers. The consequence was, it is stated—

"An entire alteration of two of the ordinary conditions of disease, and a displacement of the usual seasons of cholera." The heavy rainfall in September, above mentioned, "flooded the whole country, almost utterly destroyed most of the Native villages, and ruined the standing crops. It was the last great burst of the season, and the rainy season may be said to have ended with it. Such a storm had not been known for many years."

In the Sultanpur district, it is recorded, "the rains were unusually heavy and destructive. In some villages not a single house was left standing, nor a single wall which had not fallen in." 24.50 inches of rain fell in September, and "the people suffered from wet, cold, and hunger."

In Bara Banki 75.30 inches of rain fell during the year, of which 28 inches fell in September.

In Rae Bareli "the rainfalls of August and September were so prolonged that about three-fourths of the houses of the district were irretrievably damaged or completely washed away. Jhils overflowed through streets and gullies into wells. Ordinary sickness and mortality increased under the misery from exposure to prevailing wet that existed."

In Unao, it is stated, "the hot season of 1871 was of an exceptionally mild character, the mean temperature of the summer months being considerably under the average." Only 41.90 inches of rain are noted for the year, and of this quantity only 6.30 inches fell in September. No rain was registered in October or November, but 2 inches in December.

In Sitapur, it is stated, "the year was remarkable for its low temperature and the very large amount of rainfall. In the months of April, May, and June, in place of the ordinary dry hot winds, there was cloudy weather, with frequent, almost daily, showers. The periodical rainfall was largely in excess of the average fall." During the year 50.80 inches of rain fell, of which only 8 inches were measured in September, none in October or November, and 1.50 inch in December.

In Gonda the total rainfall was 84.20 inches, of which 33.90 inches fell in September, none in October and November, and but 0.30 inch in December. The rains terminated on the 19th September; "but though they terminated thus early, the ground continued moist longer than usual, the atmosphere was unhealthy, and there was much malarious fever."

In Hardoi the total rainfall was 40.10 inches, or 7.10 inches less than in 1870; 5.70 inches were measured in September, none in October and November, and 2.60 inches in December.

In the Kheri district the rains of 1871 were, it is stated, unusually early, heavy, and protracted; the total amount measured was 71.70 inches, of which the largest fall, 29.80 inches, was in July; in September the fall

was 11.30 inches; none was measured in October or November, and 1.90 inch in December.

In Bahraich the total rainfall was 85.80 inches, of which the greatest fall, 30.70 inches, was measured in September, none in October or November, and only 0.50 inch in December.

Regarding food-supply, the year 1871, in comparison with the two preceding years, was a year of plenty both in the North-Western Provinces and in Oudh.

1872.—In this year, the first of the triennial cycle 1872–74, cholera prevailed with a fresh revival of epidemic activity in the normal course of its cyclic periodicity. Among the civil population the death-rate rose to 1.83 per mille against 0.48 in the preceding year. This fresh revival of cholera activity in 1872 in these provinces was coincident with a marked deficiency in the rainfall following upon a year of exceptionally abundant rainfall, although the fall for the year was still above the average by about $3\frac{3}{4}$ inches. The rainfall of 1872 was about $12\frac{3}{4}$ inches less than that of 1871, and it was accompanied by a considerable rise in the prices of food (see Table No. V.) The effect of this diminished rainfall upon a soil saturated by two previous years of unusually heavy rainfall would be to favour rapid evaporation of moisture from its surface, and to produce sudden and great changes in the temperature and humidity of the lower strata of the atmosphere.

The total number of deaths registered from cholera in the North-Western Provinces during 1872 amounted to 50,565 against 3473 in 1871, or at the rate per mille of population of 1.64 against 0.11 respectively; and in Oudh to 26,566 against 16,032, or at the rate of 2.37 per mille against 1.43 respectively. The incidence of the disease among the civil population is shown according to distribution by districts and by months respectively. Regarding the prevalence of the cholera of 1872 in the North-Western Provinces, it is observed by Dr. C. Planck, in his Sanitary Report for this year, that "the usual law of seasonal epidemic prevalence, which appears to require that cholera should prevail early in the year in the southern and eastern districts, and gradually spread up to the north, was well marked in 1872." The returns show that cholera was epidemic in the southern districts from March to June, in the Lower Doab from May to September, in the Upper Doab and Rohilkhand from August to November, and that the disease was nowhere epidemic in the Bandelkhand country to the south of the Jamna River.

In Oudh, also, the returns show a marked increase in the prevalence of cholera in 1872. The epidemic which prevailed with violence towards the close of the preceding year appears to have abated entirely in most of the districts during the early part of 1872. Sultanpur and Partabgarh only show its presence in activity in February, and in these districts the disease acquired considerable epidemic force in March, but it subsided suddenly on the establishment of the rains. In the other districts of Oudh cholera reappeared with energetic force during March and April, and prevailed epidemically with more or less of violence and persistence to the close of the year, when there was a general subsidence of the disease in all the districts. At the close of the year, however, cholera was still active in Lucknow, Rae Bareli, Bahraich, Gonda, and Fyzabad.

Regarding meteorology, it is recorded that the meteorology of the year 1872 in the North-Western Provinces was peculiar in regard to the unusual heat of the sun's rays, the unusual cold of terrestrial radiation, and to rainfall in the first five months of the year in excess of that of the

same months in the previous years. The average results of observations on temperature, humidity, and rainfall at the fourteen stations in the North-Western Provinces are shown in the subjoined tabular statement for comparison with the corresponding statement for the preceding three years :—

Year 1872.	Temperature. Means.					Humidity.	Rainfall in Inches.
	Max. in Sun's Rays.	Min. on Grass.	Max. in Shade.	Min. in Shade.	Mean in Shade.		
January	126	31	74	38	56	73	2·24
February	137	33	84	40	62	58	0·75
March	154	44	97	56	76	46	0·37
April	157	51	101	63	82	44	0·54
May	161	57	107	66	86	44	0·91
June	164	68	110	71	90	59	4·67
July	158	64	94	72	83	80	14·51
August	154	70	95	73	84	84	15·07
September . . .	155	61	92	66	79	80	6·30
October	148	47	91	56	74	63	...
November	143	37	88	46	67	57	...
December	134	35	81	42	61	65	0·20
							46·5

In the years previous to 1872 there certainly was some rainfall in the first five months, but it was not so carefully recorded as in 1872. The figures in the above tabular statement represent the results of the records of the fourteen stations in the North-Western Provinces as a whole, but they do not represent the actual climate of the very different regions in these provinces—the hills, the plains, and the intervening tracts, each of which is represented by some one or more of the fourteen registering stations; such as Chakrata and Ranikhet, averaging 6513 feet above the sea, for the hills; Dehra Dun, Rurki, Bareilly, Meerut, and Gorakhpur, representing the climate of the intervening tracts; and Agra, Fatehgarh, Lucknow, Allahabad, Benares, Jhánsi, and Ajmir, representing the climate of the plains. In illustration of the climate of these different areas within the limits of the North-Western Provinces, Dr. C. Planck, in his Sanitary Report for the North-Western Provinces for 1872, furnishes the subjoined tabular statement, prepared from the meteorological records of these provinces for that year :—

Months.	Temperature.															Humidity.			Rainfall in Inches.		
	Maximum in Sun's Rays.			Minimum on Grass.			Maximum in Shade.			Minimum in Shade.			Mean in Shade.								
	Hills.	Under Hills.	Plains.	Hills.	Under Hills.	Plains.	Hills.	Under Hills.	Plains.	Hills.	Under Hills.	Plains.	Hills.	Under Hills.	Plains.	Hills.	Under Hills.	Plains.	Hills.	Under Hills.	Plains.
January	125	129	131	21	34	33	61	75	78	29	39	40	45	57	59	67	78	71	2·27	3·47	1·36
February	124	136	145	20	35	35	66	83	91	28	40	43	47	61	67	56	59	55	2·30	1·25	0·24
March	145	155	157	34	44	45	80	96	103	39	51	56	59	73	79	56	53	40	1·18	0·41	0·12
April	149	156	161	38	52	55	77	102	107	41	63	63	59	81	85	51	49	39	2·08	0·40	0·10
May	148	163	164	43	58	61	85	108	112	49	65	70	67	86	94	49	48	38	1·98	1·19	0·41
June	150	162	167	60	69	69	86	110	116	56	72	76	71	91	96	69	62	53	6·82	6·81	2·32
July	148	155	163	53	71	72	76	95	98	58	74	75	67	85	87	87	82	77	8·42	10·37	14·21
August	150	153	156	57	71	74	75	96	94	59	74	76	67	85	85	89	85	84	14·69	14·43	15·62
September	152	154	157	49	62	63	77	94	95	53	67	70	65	80	82	84	81	78	6·20	10·54	3·28
October	150	146	155	35	46	50	75	91	96	48	55	58	61	73	77	65	66	61	...	...	...
November	143	142	147	27	38	38	73	89	95	41	47	45	57	68	70	58	60	65	0·03	...	...
December	131	134	138	26	36	36	72	80	85	34	43	43	53	62	64	65	67	63	0·52	0·28	0·05
Average of months	143	149	153	39	51	53	75	93	97	45	57	60	60	75	79	66	66	59	46·49	58·15	37·71

The table is of use for reference in respect to the prevalence of cholera in the different climatic areas during the year 1872. The figures show clearly the difference of climate in the three several tracts compared, and serve also as an index to the like differences in separate localities within the limits of each of the areas. The range of temperature of the air from maximum to minimum in the shade is a point worthy of notice, as an important factor in the causation of disturbance in the harmony of the functions of the human body. In 1872 the range of temperature of the air was unusually great, and this peculiarity in the climate of the year was coincident with an unusual prevalence of cholera. In the subjoined tabular statement are shown the range of temperature in the shade and the cholera deaths registered in the North-Western Provinces in each month of the four years 1869 to 1872 inclusive:—

Months.	Range of Temperature in the Shade.				Deaths Registered from Cholera.			
	1869.	1870.	1871.	1872.	1869.	1870.	1871.	1872.
January . . .	28	30	26	36	441	117	75	126
February . .	28	31	26	40	358	343	120	127
March . . .	28	27	31	41	1,681	723	164	1,831
April	33	31	32	38	4,452	1,847	617	12,425
May	27	22	24	41	6,923	4,031	625	10,253
June	19	22	18	39	12,630	2,270	427	6,428
July	15	16	11	22	14,383	754	195	2,505
August . . .	14	14	11	22	22,837	567	224	6,041
September . .	17	15	16	26	7,594	585	271	5,094
October . . .	23	23	28	35	5,384	784	354	4,462
November . .	30	33	30	42	1,241	774	228	1,036
December . .	29	31	29	39	397	328	173	237

In Oudh the meteorology of the year 1872, it is stated, presented no important variations from the usual averages for the several seasons, and, speaking generally, the year was a very regular and ordinary one. The observations recorded at Lucknow, however, are included in the general meteorology of the North-Western Provinces.

Regarding food-supply, it is stated that the average prices of the staple food-grains were much higher in the North-Western Provinces during 1872 than during 1871. Still the rates were considerably lower than prevailed in the years 1870 and 1869, in the latter of which years famine rates ruled; consequently, though prices were high in 1872, there was no general suffering or distress for want of food. In Oudh also there was a rise in prices during 1872, and the year was the one of greatest scarcity since 1869. Here, as in other parts of India, the mass of the population is composed of poor agricultural labourers, "to whom the price of grain means simply abundance to eat or some degree of starvation."

1873.—In this year there was a very marked abatement of cholera activity, as was due in the normal course of the periodicity of the disease. Among the civil population the death-rate fell to 0.46 per mille against 1.83. This marked abatement in the prevalence of the cholera of 1873 in these provinces was coincident with a continuation of diminished rainfall and of high prices for food (see Table No. V.) The rainfall of 1873 was about 6¾ inches less than that of the preceding year, and nearly 3 inches less than the average; and the defect, as compared with the distribution of the rainfall in 1872, occurred almost entirely in the first half of the year.

The total of cholera deaths registered among the civil population in the

North-Western Provinces during 1873 amounted to 15,248 against 50,565 in 1872, or at the rate per mille of population of 0.49 against 1.64 respectively; and in Oudh to 3961 against 26,566, or at the rate of 0.35 against 2.37 per mille respectively. In 1872 cholera suddenly burst into epidemic activity in March, and after a temporary check in July, finally abated in November. In 1873 cholera commenced epidemic activity very mildly in February, and, as in the preceding year, after a temporary check in July, finally abated in October (see Table No. II.) The epidemic of 1872 finally subsided or sank to a minimum in January 1873; that of 1873 subsided to minimum prevalence in February 1874.

In the North-Western Provinces the cholera of 1873 prevailed as an epidemic only in the Kumaun district, in the northernmost corner of the provinces, though the disease was reported from every one of the districts excepting Dehra Dun and Lalitpur. In Kumaun the disease was a continuation of the preceding year's epidemic, which prevailed in the northern districts during October and November, and in December spread in a mild form into the Tarái district, and thence in January to Kumaun, where it became epidemic from February to July. Previous to this outbreak cholera had not been epidemic in Kumaun since 1867, in which year also it prevailed during about the same season as in 1873. The continuance of cholera into the cold-weather months in these provinces was, so far as the mortuary statistics show, an unusual occurrence, the months of December, January, and February being, as a rule, entirely free of the disease, or returning but a few widely scattered deaths. In 1873, however, the disease prevailed thus exceptionally in the northernmost districts, and continued as an epidemic during the first half of the year, at a time when all the rest of the country north of Allahabad was more or less generally free from cholera. This peculiar and localised epidemic appears to have been confined to the districts of Kumaun and Tarái, and to have left Garhwál almost unaffected. In Kumaun the disease was most prevalent in the Tarái portion of the district which borders the hills, and in the outer and lower ranges of mountains; but it extended also towards the snowy range, and as far as Bhagesar.

In Oudh the cholera of 1873 was very markedly less prevalent than in any previous year since 1869. The seasons of epidemic prevalence were in spring and autumn, that is, before and after the rainy season, as in the usual course of the disease in this province, the months of February and September being those in which there is generally a marked abatement or subsidence of the disease. This is well shown in the subjoined tabular statement, which exhibits the cholera mortality registered in Oudh in each month of the years 1869 to 1873 inclusive :—

Years.	Deaths Registered from Cholera in												Total.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1869	327	177	689	2614	3394	4149	3548	4239	1725	1521	491	260	23,134
1870	113	184	540	2369	3610	1203	607	1158	1276	1722	1826	710	15,318
1871	216	95	101	128	102	99	239	345	760	3610	6476	3861	16,032
1872	251	51	1661	6052	6717	4320	1981	1997	1413	1524	482	117	26,566
1873	127	2	40	303	97	603	726	945	433	227	316	142	3,961
Ratio per mille of population	0·22	0·11	0·65	2·46	2·99	2·23	1·52	1·86	1·20	1·85	2·06	1·09	1·52
	0·33			2·56			1·53			1·67			

Regarding the meteorology of the year 1873, it is recorded that there was a marked diminution in the amount of the rainfall measured as compared with the results for the preceding years. It is stated that—

"This result is principally due, however, to the fact that the rainfall in the hills and in the eastern districts was less than usual, while districts such as Agra and Jhánsi, usually noted for their scanty rainfall, received an abundant supply."

In a tabular statement furnished by Dr. C. Planck in the cholera section of his Sanitary Report for the North-Western Provinces for 1873, exhibiting the average rainfall in different areas (viz., Hills, Tarái, Northern Districts, Central Districts, and Eastern Districts) of the North-Western Provinces in each month of that year, it is shown that a larger amount of rain fell on the plains than on the hills. In the hills the total average fall is shown to have been 35.61 inches, in the Tarái 86.80, in the northern districts 36.66, in the central districts 37.56, and in the eastern districts 35.90 inches. In the Tarái, at the foot of the hills, the fall was fully 20 inches below the usual average. In the eastern districts the rainfall was comparatively scanty, the rains having suddenly ceased there early in September, especially in Basti, Azamgarh, Gorakhpur, Jaunpur, and Mirzapur; the rainfall in these five districts in 1873 was very little more than half the usual quantity. The results of this deficient rainfall in these districts will be apparent in 1874. In the subjoined tabular statement, uniform with those given for previous years, are shown the results of the observations recorded at the fourteen stations in the North-Western Provinces, including Lucknow, in Oudh :—

Year 1873.	Temperature—Means.					Humidity.	Rainfall in Inches.
	Max. in Sun's Rays.	Min. on Grass.	Max. in Shade.	Min. in Shade.	Mean in Shade.		
January . . .	124	39	72	44	58	58	0·51
February . . .	130	45	79	51	65	54	0·31
March . . .	141	53	87	58	72	47	0·71
April	153	60	99	67	83	34	...
May	153	66	98	72	85	45	1·37
June	157	68	104	80	92	46	1·39
July	143	75	90	77	83	80	14·25
August . . .	143	71	88	75	81	81	11·00
September . .	140	69	88	72	80	79	7·91
October . . .	142	54	87	60	73	57	0·41
November . .	131	44	80	51	65	55	0·16
December . .	125	39	73	45	59	63	0·61
							38·63

In Oudh the chief feature in the meteorology of the year 1873 was the comparatively late commencement and early cessation of the rains, and the comparatively scanty total rainfall. There was no rain in June or October, instead of 5 inches and 1 inch respectively, and the quantity in July, August, and September was 4 inches short. In consequence of this deficiency in the rainfall there was a failure af the late rice crop in the districts of Gonda and Bahraich, where this crop is the chief produce of the year, and an amount of scarcity of food resulted, which bordered on famine, and "might have resulted in deaths from starvation but for the timely relief works organised." The month of June, it is also stated, in consequence of the absence of rain, was 4 degrees hotter than usual, and the months of October and

November were 2 degrees colder, in consequence of the early cessation of rain.

Regarding food-supply, it is stated that the people of the southern districts, especially Hamirpur and Banda, experienced much distress in consequence of the high prices of food in 1873, which in these parts verged upon famine rates, and were generally in the provinces at large much higher than in 1872. In Oudh the year 1873 was, on the whole, that of greatest scarcity of food since 1869, and even exceeded that year in deficiency of "juar" and "bajra" (pearl barley and spiked millet), the two grains of the autumn harvest on which the poorer classes are chiefly dependent.

1874.—In this year again there was a still further abatement of cholera, and the disease, as normally due, subsided to the minimum prevalence in the third year of its triennial cycle. The death-rate from the disease among the civil population fell to 0.15 per mille against 0.46 in the preceding year. This continued abatement of cholera in 1874 was coincident with a marked increase in the rainfall and a considerable improvement in the prices of food (see Table No. V.) The rainfall of 1874 exceeded that of 1873 by about 13⅓ inches. The excess fell entirely in the second and third quarters of the year, and mostly in the second quarter.

The total number of deaths registered from cholera during 1874 amounted in the North-Western Provinces to 6399 against 15,248 in 1873, or at the rate per mille of population of 0.20 against 0.49, respectively; and in Oudh to 68 against 3961, or at the rate of 0.01 against 0.35, respectively. The distribution of the disease by districts is shown in Table No. I., and by months in Table No. II. A glance at the latter will show that the abating epidemic of the preceding year finally sank to its minimum in February 1874, and that in the following month the epidemic of this year commenced activity by very small and slow degrees, and with the usual temporary check in July, attained its maximum prevalence during September and October, and finally subsided to its minimum prevalence in January 1875, the disease all through manifesting very weak epidemic activity.

In the North-Western Provinces the cholera of 1874 prevailed in an epidemic form only in the districts of Gorakhpur, Basti, and Azamgarh, and more mildly in Benares, Ghazipur, and Mirzapur. In these districts the rainfall of 1874 was plentiful in succession to a season of unusual drought, as will be seen further on, and as has been referred to at the latter part of the preceding year's review. The disease, however, was present in all parts of these provinces, deaths from cholera being reported from nearly all the districts in every month of the year, except from the districts of Kumaun, Garhwál, and Tarái, in the hills to the north-east, and of Jalaun, Jhánsi, and Lalitpur, in Bandelkhand territory to the south-west and beyond the Jumna. In these districts, at the opposite extremes of the province, there was a marked immunity from cholera throughout the year; Kumaun returns only one death altogether, in May, and Jalaun two, viz., one in January and one in June; the other districts of these two groups return no deaths at all from cholera throughout the year.

In all the other districts, excepting the south-eastern, in which the disease prevailed with more or less severe epidemic activity, cholera is shown by the returns to have been prevalent only in a very mild degree. The figures show that cholera was present in the Benares district throughout the year, and with two periods of greater activity, namely, during May and June, and during September and October, but in neither period did the mortality attain any serious proportions. In Azamgarh the disease appeared in February

with small beginnings, increased gradually and slightly till May, when it acquired fresh activity and prevailed, with a slight check in July, till it attained the climax in September, after which it rapidly subsided to a minimum prevalence, the presence of the disease at the close of the year being represented by a single death in December. In Ghazipur cholera was present in January, but seems to have disappeared during all February and March; in April it reappeared, and then prevailed steadily to a low climax attained in September; from this point the disease abated, and subsided into quiescence in December. In Gorakhpur the fitful presence of cholera is marked by single deaths recorded in January, February, and April, and then by the outbreak of the disease in epidemic form in July, in which month 12 deaths were registered; the mortality rapidly increased during the succeeding months, and in October attained the climax, marked by 2296 deaths in that month; the epidemic then suddenly subsided, and in December the deaths fell to only 4. In Basti, with the exception of 2 deaths in May, there was no cholera mortality recorded during the first six months of the year; but in July, as in Gorakhpur, the disease burst out in epidemic form, though with far less severity than in that district, and prevailed in maximum intensity during October and November, the deaths registered being 467 and 367 respectively; in December the epidemic abated, and the mortality of the month was equal to that in August. In each of these districts the disease was widely diffused, and not confined to any one locality; in Basti 13 registration circles were affected, and out of a total of 4020 villages in the district 152 recorded deaths from cholera.

In the Oudh districts there was a singular immunity from the prevalence of cholera during 1874. Partabgarh and Gonda returned no cholera mortality at all, and the other districts together returned only 68 deaths for the whole year; the highest mortality of any one month was only 11 deaths, in July, and again in December; the next highest number was 10, in August, and the next 9, in February; in January, June, and October only single deaths were recorded, and in September none at all. So low a cholera mortality had not been known in Oudh since the establishment of registration in 1868.

Regarding the meteorology of the year, it is shown by the observations recorded that the mean temperature of the year 1874, in all the months, excepting April, May, September, and October, was less than the mean for the preceding twelve years. In the year 1873, as has been noted in a previous passage, the rainfall on the hills was less than the rainfall on the plains; and districts noted for scanty rainfall—such as Agra and Jhánsi—received an unusually abundant supply, whilst districts noted for plentiful rainfall—such as Gorakhpur and Benares—received a poor supply. In 1874 exactly the opposite of these conditions was observed to obtain; the hills and the eastern districts received in this year their usual large supply, and Agra and Jhánsi were scantily supplied. The rainfall of 1874 is shown also to approximate to that of 1871; both these years were alike noted for their plentiful and early established rains, and in both years alike cholera was very little prevalent. The rainfall of 1874, however, as that of the previous years, was very unequally distributed over the provinces as a whole.

In Oudh the chief features of the meteorology of the year 1874, as observed at the Lucknow Observatory, were, as reported by Dr. Bonavia, an unusually high mean temperature in April and May coincidently with a prevalence of westerly winds, and unusually dry atmosphere and absence of rain; an excess of rain in the rainy season proper (June to September) of

8 inches above the average, along with an unusual predominance of easterly winds; and a greater depression than usual in the atmospheric pressure before the rains set in, especially in the month of May, although the barometer followed, on the whole, its usual course, falling from March to June, and again rising to October, the extreme monthly means being 29.50 inches and 29.16 inches. As a rule the current of the south-west monsoon, after blowing up the Bay of Bengal, is deflected in its northern progress by the Himalayas, and arrives in Oudh as an easterly wind, generally south-east. It is always a comparatively cool and damp wind, and brings up the rain. The counter current has a westerly direction, generally north-west. It is always comparatively hot and dry, and is known as the hot wind.

Regarding food-supply, prices in 1874 were somewhat lower than in 1873, but they still ranged high. In some of the districts of the east and south prices were very high in the early part of the year, indicating a condition of food-supply verging on serious scarcity. "The districts of the Benares division felt the scarcity in the greatest measure, though in some districts of the Allahabad division also an approach to famine prices was established in the first months of the year." In the Basti and Gorakhpur districts, where the scarcity was greatest, prices were at almost famine rates for the first six months of the year. During this time of scarcity many thousands of persons were employed on famine works established by Government, and by the timely measures of relief thus set on foot were enabled to tide over the hard times, till, as the season advanced and proved favourable for agricultural purposes, prices fell, and the distressed people found remunerative employment in the fields.

In Oudh there was no such scarcity. The prices of the principal food-grains were cheaper than in 1873, especially the price of wheat; still they were rather above the average of the five years preceding.

1875.—In this year, the first of the new triennial cycle 1875–77, cholera, as was due in its normal periodic course, prevailed with a fresh revival of epidemic activity. The death-rate from the disease rose among the civil population to 1.54 per mille against 0.15 in the preceding year. This revived epidemic activity of the cholera of 1875 in these provinces was coincident with a considerably diminished rainfall, following upon a year of abundant rainfall, which terminated with a period of drought in its last quarter (see Table No. V.) The rainfall of 1875, although somewhat above the average, was more than 11 inches less than that of the preceding year, and the defect was most marked in the second quarter of the year. The prices of food in 1875 were generally cheap, and this circumstance no doubt exercised some influence in mitigating the severity of this revived epidemic as compared with that of 1872, in which year food was very dear.

The total number of deaths registered from cholera in 1875 among the civil population of the North-Western Provinces was 41,106 against 6399 in 1874, or at the rate per mille of population of 1.33 against 0.20 respectively; and in Oudh 23,321 against 68, or at the rate per mille of 2.09 against 0.01 respectively.

In the North-Western Provinces the cholera of 1875 prevailed with more or less of epidemic activity in all the districts, excepting Kumaun and Tarái in the north, and Jhánsi and Lalitpur in the south. A comparison of the death returns for 1875 with those for the preceding year shows that the cholera which was prevailing epidemically during the latter half of 1874 in the south-eastern districts of Basti, Gorakhpur, Azamgarh, and Benares had completely subsided at the close of that year in all of them, excepting

Benares, in which cholera was still active in January 1875. In this last-named district and in Mirzapur the disease acquired fresh force in February, and in the same month it also reappeared in Azamgarh. In March the disease reappeared in force in Gorakhpur and Basti; and in April in Ghazipur. In all these districts cholera prevailed with much epidemic severity from March to August, the period of greatest intensity being during the months of April, May, and June. Towards the close of the year the disease had subsided in all the districts mentioned, except in Basti and Gorakhpur, in both of which it acquired fresh activity—in Basti in November, and in Gorakhpur in December. In all the other districts of the North-Western Provinces the year 1875 opened with cholera present in one or more of the districts of each of the divisions not already referred to; thus, a few deaths from the disease were recorded in January in two districts of the Rohilkhand division, in three of the Meerut division, in four of the Agra division, and in two of the Allahabad division. In February cholera was reported from one more district each in Rohilkhand and Meerut divisions, and from the four remaining districts of Allahabad division. In this last division cholera broke out epidemically in the Allahabad and Jaunpur districts, and rapidly increasing, attained its climax in Jaunpur in April, and in Allahabad in April and May. In April cholera was present in all the districts of these divisions excepting Meerut. In this district there was no death recorded from cholera, excepting a solitary death in January, until the month of June. Otherwise the disease prevailed epidemically everywhere till September, when there was a general abatement in its activity, except in the districts of the Rohilkhand division. In these the disease had acquired activity later in the season, and did not attain its climax till the months of September and October. At the close of the year cholera had subsided everywhere, except in Basti and Gorakhpur, where it showed revived activity in December, and in Budaun and Sháhjahánpur, where it was declining in December from the epidemic prevalence of the preceding months.

Thus it appears that, excepting the two districts in the north and the two in the south before mentioned, the cholera of 1875 was present in sporadic form in all parts of the North-Western Provinces during January and February; that in March it began to be epidemic in the eastern districts —Basti, Benares, Mirzapur, Jaunpur, and Allahabad—and in April prevailed epidemically in all the eastern districts; that in May the epidemic prevalence had extended to nearly all central and western districts, and continued through the succeeding months till August, but with no severe mortality anywhere; that in September and October the epidemic prevalence declined in the eastern districts and commenced in the western, where it continued through November, and was on the decline in December. In Basti alone of all the districts was there any decided indication of renewed cholera activity at the close of the year.

Compared with the results for the preceding ten years, the epidemic cholera of 1875 was less severe than the epidemics of 1865, 1867, 1869, and 1872, but it was more widely diffused over the country, and for the first time since 1867 prevailed in Garhwál. Though the disease was widely diffused over the provinces, it by no means prevailed equally in all parts of the country; on the contrary, as has been noticed before, it prevailed in particular areas and localities in those areas in preference to others. This is well illustrated by the returns from the Banda district, in which, out of a total of 1231 villages, only 220 were affected by cholera; and of this number

in only 26 were more than 10 deaths from cholera recorded. In this district the prevalence of cholera may be divided into three portions, viz., one including 8 villages in the west part of the district, one of 97 villages in the midst of the district, and one of 115 villages in the eastern part of the district.

In the Oudh districts the cholera of 1875 was a reappearance of the disease after a year of very marked abeyance, only 68 deaths from this cause having been recorded throughout the province during 1874. In Oudh the year 1875 opened with no sign of the presence of cholera in any of the districts during the month of January. In February 56 deaths were returned from 5 out of the 12 districts, and of the whole number 43 occurred in Partabgarh, the most southerly of the districts, and the remainder, excepting a single death at Lucknow, occurred in the adjacent districts of Sultanpur, Rae Bareli, and Fyzabad. In March the disease was active in all the districts, excepting only Hardoi, and the total of deaths registered was 824. In April cholera was violently epidemic in all the districts, and caused the maximum mortality of the year—8726 deaths. During the succeeding months the mortality fell by about halves of the preceding monthly prevalence to 979 deaths in August. In September the disease resumed fresh activity, and in October the mortality was double that of August. In November the mortality again declined, and the deaths fell to less than half the number registered in August. Finally the year closed with a fresh renewal of activity, the deaths registered in December amounting to 989; of this number more than half occurred in the two districts of Rae Bareli and Fyzabad, in which there was a renewal of cholera activity during the last three months of the year. In the Sultanpur district the spring epidemic of cholera was succeeded by a fresh outbreak in November, and this continued active in December. In most of the districts there were two periods of maximum prevalence of cholera during the year, in a few only one. The minimum prevalence was in February. In March, with the increasing heat and appearance of new grain and vegetables, cucumbers, &c., the mortality began to rise, and reached its first maximum in either April, May, or June; usually in June and July there was a lull or subsidence; but in August the mortality again began to rise, and this continued through September and October, and sometimes November; there was then, as a rule, another decline in December, which continued through January to the minimum or final subsidence in February. Such was the course of the cholera mortality of this year in Oudh, as shown by the provincial figures. Throughout the epidemic of 1875 there was no regular progress of the disease in any one definite direction; there was rather a series of isolated outbreaks in different and often widely separated spots.

The first recorded deaths of the year occurred almost simultaneously in the three south-eastern districts, viz., in Fyzabad on 16th February, in Rae Bareli on the 17th, and in Partabgarh on the 19th. In Sultanpur the disease appeared on the 28th February, in Lucknow on the 27th, and in Gonda on the 2d March. In Kheri, in the extreme north-west of the province, the first case reported occurred on the 8th March, or nearly a week before the disease was reported in Bahraich, which lies between Kheri and Gonda. In Unao, next to and to the west of Partabgarh, the first cholera death was reported on the 10th March, in Sitapur on the 15th, and in Bara Banki on the 26th. In Hardoi cholera was first reported on the 11th April. It is to be observed, however, that the disease was present in the adjoining districts of the North-Western Provinces during the early part of the year, viz., in Allahabad and Cawnpore in January, and in Jaunpur, Azamgarh, and Fatehpur in

February, and that in all these districts, as also in Basti, the disease became epidemic in March.

It is stated that on the appearance of cholera—

"As a result of panic, not only do the residents of a stricken village or hamlet quarantine themselves in their own houses, but the residents of the villages around do all in their power to keep any member of an infected village from communicating with them and their own cluster of huts." Another custom in vogue in some parts of the country is "that of hastily burying those dead of cholera in shallow graves close at hand, to disinter them for either cremation or disposal in the sacred rivers when the epidemic has ceased."

Regarding the meteorology of 1875 in the North-Western Provinces, it is recorded that the temperature of the air in January and February was below the general mean for these months, and in March, April, and June considerably above it, but in May below it. In the remaining months it was also below the general mean. The year 1875 was thus a year of temperate cold season, of ardent hot season, and as the year progressed the heat was tempered by plentiful rain. As regards humidity, it is shown by a tabular statement of observations recorded that during the hot season and rains the temperature is apparently governed by the moisture, being higher as the moisture in the air is less, and *vice versâ*. Thus in March, April, and June the moisture was less, the temperature greater than the general mean. In May the moisture was greater, the temperature less; and the same rule holds good for the months of the rainy season, with the exception of July, in which month the moisture and temperature were both less than the general mean. The prevailing winds in 1875 were west and north-west during the first three months, west in April, and east in May. During June and July they varied from east to west, in August were east and south-east, and in September east. During the remaining three months the wind was west. The east wind in May probably accounts for the excess of moisture in the atmosphere during that month. In regard to the rainfall, it is shown that a fair average of rain fell during the year in the districts of the plains, but that the fall in June was much less than that in the same month of the preceding year. This deficiency, however, was amply compensated for by the fall in the succeeding three months, in which the rainfall was greater than that recorded in the same months of any of the preceding five years. The distribution of the rainfall of 1875 was somewhat peculiar, principally in the more liberal supply which fell in the Agra and Ajmir country, and the diminished supply which fell in the Gorakhpur and Benares country. In 1874 exactly the opposite of this was noticed; in 1875 the distribution corresponded with that of 1873.

In Oudh the meteorology of 1875, as represented by the observations recorded at Lucknow, was characterished by a diminished atmospheric comparative pressure throughout the year, except in November, and this was most marked in March and April. In other respects the usual law was obeyed of a gradual fall from January to June, and a gradual rise from July to December, with the numerous intermediate fluctuations ordinarily met with. In this year the point of greatest depression, usually met with in the last week of June, was postponed to the second week in July. The mean temperature was about the average in January, and 2.4° below it in February. March and April were much hotter than usual, and May cooler. The months from June to October inclusive cannot be considered as varying much from the average. November was colder by 3.5°, and December hotter by 8.2°, than usual. The hot season was most marked apparently by intense heat

and dryness of atmosphere. The humidity of the atmosphere was below the average during nine months, being in excess only in January, August, and September. The diminished humidity was most marked in March and April and in June and July, and in these months there was diminished rainfall. Westerly winds prevailed, as usual, during the first four months of the year. In May easterly winds commenced to get the upper hand, and this continued to the end of the rains in September, when westerly winds became again the most common.

Regarding food-supply, the year 1875 was a year of cheap food such as the people had not experienced since 1871. This general condition of plenty was not quite equally distributed over the provinces; but in every division there was a decided improvement over 1874 in this respect. Especially in the districts of Basti and Gorakhpur, threatened by famine in the preceding year, prices in 1875 were remarkably cheap.

1876.—There was a marked abatement in the prevalence of cholera in this year in these provinces, and this was according to the normal periodic course of the disease due in this the second year of the triennial cycle. The cholera death-rate fell among the civil population to 1.13 per mille against 1.54 in the preceding year. In the North-Western Provinces the total number of cholera deaths registered in 1876 amounted to 26,304 against 41,106 in 1875, or at the rate per mille of population of 0.85 against 1.33 respectively; and in Oudh to 22,007 against 23,321, or at the rate of 1.84 per mille against 2.09 respectively. This abatement in the prevalence of the cholera of 1876 in these provinces was coincident with a continued diminution in the rainfall, and with a continued increase in the cheapness of food (see Table No. V.) The rainfall of 1876 was about 8 inches less than that of the preceding year, and it was also about 6½ inches less than the average.

In the North-Western Provinces the cholera of 1876 is shown by the mortuary returns to have been a little more than half as prevalent as that of the preceding year. Compared with the corresponding returns for 1875, the returns for 1876 show that the cholera of the latter year had subsided from the epidemic activity of the former year in the districts of the Agra and Meerut divisions, but continued in revived epidemic activity in the districts of the Benares, Allahabad, Rohilkhand, and Kumaun divisions. In the last-named division the district of Garhwál, which suffered severely in the preceding year, enjoyed complete exemption in this, while the districts of Kumaun and Tarái, which were scarcely affected in 1875, were severely visited in 1876. The returns for 1876 show that cholera was present somewhere or other in all the divisions, except those of Agra and Kumaun, in January, although this presence is represented in the Rohilkhand division by only a single death in the Bijnor district, and in the Allahabad division by only four deaths, all in the Allahabad district. In February the disease became epidemic in the Benares and Mirzapur districts, and in March in those of Ghazipur, Azamgarh, Allahabad, and Jaunpur. In April cholera became epidemic in Basti, and increased in prevalence in the districts already epidemically affected, and broke out also in the Kumaun Hills in the extreme north, and in Bareilly in the plains in that direction. In May the disease was epidemic in Kumaun, in Bareilly, and in all the districts of the Allahabad division, excepting Cawnpore, and in all the districts of the Benares division. In June it became epidemic in Cawnpore, and prevailed with considerable severity in all the districts previously epidemically affected; and this continued during the next two months. In September the disease abated considerably in most of these districts, and by November had subsided every-

where, except in Bareilly and Cawnpore, where it was still in course of subsidence. In December the epidemic of the year had entirely subsided everywhere, the total deaths registered from cholera in the 32 districts during this month amounting only to 31. The returns show that, as usual, whilst cholera may prevail in the eastern districts as early as February, it does not commence to prevail in the north-western districts *until* May. They also show that, whilst the serious prevalence of the disease ceased in the eastern districts as early as July, it continued even to October in the north-western districts. The marked subsidence of the disease during the cold season is shown also in accordance with the usual course. In the year 1876 cholera affected 3281 villages and towns out of a total of 91,274 in the North-Western Provinces. Out of this number 2240 returned less than and up to 5 deaths each from cholera, and 1041 returned more than 5 deaths each. Of this latter number 429 returned more than 10 deaths each, and only 163 returned more than 20 deaths each. In this last category are included the cities of Pilibhit, with 159 deaths, Bareilly 349, together with its suburbs of Purnapur 32, Laiha 26, and cantonment Sadr bazar 25; the city of Sháhjahánpur 43, Fatehpur 52, Banda 22, Budokhár 45, Allahabad city 41, Almora 116, and, in the Tarái, Kashipur 42, and Girdhai 21.

In Oudh the cholera of 1876 was more fatal than usual, the death-rate being 1.84 per mille of population against 1.33, the mean of the preceding seven years. The districts of Rae Bareli and Gonda suffered the most severely. The disease in the province generally followed its usual course; rising from its minimum of prevalence in the first quarter of the year, it attained its maximum in the second, began to decline in the third, and sank towards its minimum again in the fourth quarter. The period of heaviest mortality was in May, with 4892 deaths, June 8907—the climax of the year—and July 3979. The periods of lowest mortality were January to March, and again October to December, inclusive. The smallest number of deaths registered in any one month occurred in February with 13, the next in March with 25, and then in December with 30. October and November show a corresponding decline from the preceding months of August and September, the numbers being respectively 478 and 286 from 1606 and 1070. In this year cholera first became prevalent in the eastern districts, Partabgarh excepted, the districts of the Sitapur division, in the north-west of the province, remaining completely exempt until June, in which month the disease appeared in the Hardoi district. In July it appeared, and with greater severity, in Kheri.

The meteorology of the North-Western Provinces for 1876 is summarised as follows from the results recorded at the five observatory stations—Rurki, Bareilly, Agra, Lucknow, and Benares:—

"With regard to *atmospheric pressure*, the one noticeable feature of the records is that, whereas the rule of averages shows that the lowest pressure usually occurs during the month of June, it was not recorded anywhere until the month of July in 1876. With regard to the *temperature of the air*, the chief peculiarity is its excessive temperature during the months of June and July; with regard to the *humidity of the air*, its excessive dryness during May and June; with regard to *rainfall*, its extreme scantiness during June, and so serious failing for the year as may be represented by the figures 42.39, average fall of the years 1871–76, and 28.88, the fall of 1876." The above indicated that "unusual climatic phenomena, namely, prolonged light pressure, excessive temperature, and unusual dryness of the atmosphere, with an almost total absence of rainfall until July was well advanced," were observed in the months of May, June, and July. In these three months the total mortality registered in the North-Western Provinces exceeded by 23,755 deaths the average mortality of the same three months for the previous four years.

In Oudh the meteorology of 1876, as represented by the records of the Lucknow Observatory, was, it is stated, abnormal.

"There was an unusual prevalence of wind from the west or dry quarter, especially in June; a rainfall 26 inches below the average, and a mean temperature 6° F. above it These are more or less consequences. The vapour which falls as rain and cools the air comes up with the damp or east wind."

The food-supply in 1876 was unusually plentiful, and prices were considerably cheaper than in any previous year since 1863. This cheapness of food was pretty evenly distributed over these provinces.

1877.—Cholera in this year still further abated to a minimum of prevalence, as was due in the normal course for this the third year of the triennial cycle. The death-rate of the year from this disease among the civil population was 0.74 per mille against 1.13 in the preceding year. The total number of cholera deaths registered among the civil population in the North-Western Provinces was 18,309 in 1877 against 26,304 in 1876, or at the rate per mille of population of 0.59 against 0.85 in 1876; and in Oudh, 13,461 against 22,007, or at the rate of 1.12 against 1.84, respectively. This slight abatement of cholera in 1877, as compared with the abating prevalence of the disease in the preceding year, was coincident with a very marked deficiency of rainfall, amounting to only 23.18 inches, and producing severe drought, and with a great rise in the prices of food, verging upon famine rates (see Table No. V.) The rainfall of 1877 was about 9¼ inches less than that of 1876, and about 15 inches less than the average.

Comparing the death returns for 1877 with the corresponding returns for 1876, it appears that in the Oudh districts the intensity of the cholera of 1877 was considerably less than that of the preceding year, taking the districts all together, but that separately they were affected very differently in the two years. Thus Sitapur in 1877 returned a total of 1396 deaths from cholera against only 28 in 1876; similarly Lucknow 182 against 1117, Unao only 5 against 1428, Rae Bareli 194 against 6635, Sultanpur 592 against 1712, Partabgarh 300 against 971, Bahraich 2188 against 1981, Gonda 4860 against 5409, Fyzabad 2503 against 1487, and Hardoi 5 against 32 (see Table No. I.) The Hardoi district enjoyed a marked immunity from the disease in both years. The death returns for Oudh show the cholera of 1877 in Oudh to have been a new revival of the disease in that year. In January 1877 no death from cholera was registered in any one of the districts; in February, also, none of the districts returned any deaths from cholera, excepting Gonda and Fyzabad, in which the epidemic of 1876 had ceased entirely in December and November respectively of that year. In March every one of the twelve districts was affected by the disease, but in very varying degrees of prevalence. In Hardoi and Unao only a few scattered cases occurred throughout the year. In Lucknow the disease ran a mild but persistent course to the end of the year. In the other districts it ran a more or less rapid epidemic course; but everywhere subsiding in August, finally ceased in September, except in Bara Banki and Fyzabad, where the epidemic was still in course of subsidence. Towards the close of the year the disease reappeared in the districts of Sultanpur, Partabgarh, Bahraich, and Gonda.

In the North-Western Provinces cholera was present in January in three districts of the Benares division, and in February appeared in two more districts of the same division, and in March became epidemic in all its districts. The disease prevailed in this division to the close of the year, with

more or less activity, and was more prevalent in December than it had been in the preceding January, the registered deaths being 134 in the former month against only 11 in the latter. The districts of the Jhánsi division, in the Bandelkhand country, are shown by the returns to have enjoyed their usual exemption from epidemic cholera. In the districts of the Allahabad division the cholera of 1877, as compared with that of the preceding year, shows a marked decline in prevalence everywhere, except in the Banda district, where the mortality was nearly 2½ times greater in 1877 than in 1876. In all the other districts of the North-Western Provinces, except Muttra and Agra, in which there occurred an unimportant increase of mortality, the cholera of 1877 was greatly less prevalent than that of 1876. During 1877, as was also the case in 1870, the epidemic prevalence of cholera in the North-Western Provinces was principally confined to the country north of the Gogra, with here and there detached localities of prevalence in the eastern districts, and one locality of prevalence in Banda. The mortuary returns show that cholera has prevailed in the trans-Gogra country and in the Banda district during the three years 1875, 1876, and 1877. During the year 1877 the epidemic prevalence of cholera was confined principally to the Gorakhpur, Basti, Gonda, and Bahraich districts, north of the Gogra River, and to the Sitapur and Fyzabad districts, which adjoin that river southwards. The months of this epidemic prevalence were March to July inclusive. These six districts of epidemic prevalence contain a total of 26,720 towns and villages. Out of this number deaths from cholera were reported from 2582, or about one in ten. The minor epidemic prevalence in the Banda district occurred during May, June, and July, and in a total of 1240 centres of population in that district cholera deaths were reported from 358, or about one in four. The disease was prevalent in sixteen registration circles, and was epidemic in eight circles immediately adjoining and including Karhana circle, in which cholera was epidemic in 1876. "This persistent prevalence of the disease in some mortuary circles of the province" is referred to by Dr. C. Planck as a noteworthy fact. "Thus in the Paikulia circle of Basti the disease was epidemic in 1875, 1876, and 1877. In Rudrapur circle of Gorakhpur there was epidemic prevalence in 1875 and 1877, and marked prevalence in 1876. In Kulpahar circle of Hamirpur district there was marked prevalence in 1875 and 1876, and epidemic prevalence in 1877. In Sansolar circle of the same district there was epidemic prevalence in 1875, marked prevalence in 1876, and again epidemic prevalence in 1877. In Mara circle of Allahabad district there was epidemic prevalence in 1875, 1876, and 1877. In Shahganj circle of Mirzapur district the same fact appears." It is related, also, that in the Amorha circle of Basti district, in which cholera had been epidemic in the three years 1875, 1876, and 1877, the disease in the last of these years was reported from 36 villages in all, out of a total number of 201 reporting in this circle. Of these 36 villages, 29, which reported altogether 189 cholera deaths, are recognised as to locality by their names on the map, the other 12 being untraceable thereon. In the villages the localities of which are known cholera prevailed principally in two clusters of villages—one to the west, the other to the east, of the circle—and the mortality from it was most marked in at least four villages widely divided by lands of unaffected centres of population. This chief prevalence of the disease in the two widely separated clusters of villages, and again in the isolated villages, is a fact worthy of note as pointing to local conditions favourable to the manifestation of the disease. From the returns received from twenty-three districts, containing

a total of 70,186 villages and towns, during the prevalence of the cholera epidemic of 1877, the number of towns and villages affected by cholera is shown to be 3660. Of this number 432 reported more than 5 deaths each, 278 more than 10 deaths each, and 116 more than 20 deaths each; the remainder, 2834, reported less than and up to 5 deaths each. Among the centres of population returning more than 20 deaths each are included the towns or cities of Muttra, with 78; Agra 60, Jaunpur 166, Fyzabad 40, Ballia 34, Benares 137, and Mirzapur 351.

The meteorological peculiarities of 1877 in the North-Western Provinces and Oudh as a whole are summarised as follows:—

"A lessened temperature and increased moisture of the air during the first four months of the year as compared with the mean of the previous nine years, and an increased temperature and lessened moisture of the air for the remaining months. . . . The rainfall of 1877 was peculiar in that, whereas during its period of cold season—January, February, March, and December—the rainfall was excessive, during its period of rainy season—July, August, September, and October—the rainfall was extremely scanty." The coincident peculiarities of mortality in 1877, it is stated, "were a lessened total mortality as compared with that of the previous two years, and especially a decreased prevalence of deaths from cholera, smallpox, and fever."

Regarding the food-supply of 1877, the returns show a great change from the plenty and cheap prices of the preceding year, and high prices, verging upon famine-rates towards its close, ruled nearly throughout the year. The average price of the staple food-grain, wheat—which was 26.30 sers the rupee in 1876—rose to 16.20 sers the rupee in 1877. It is stated that "the famine price of food had commenced to influence the mortality of the year before it closed," and that this "is sufficiently shown by the excessive mortality recorded in December."

1878.—In this year, the first of the new triennial cycle 1878–80, there was, as normally due in the periodic course of the disease, a fresh revival of epidemic cholera activity, but it was not so great as usual on such occasions of the cyclic revival of the disease. The reason of this will be presently explained. The revived epidemic activity of cholera in 1878 in these provinces is most clearly marked in the returns relating to the troops and jails; very much less so in the death-returns for the general civil population. Among the civil population the death-rate was 0.80 per mille against 0.74. The total number of cholera deaths registered in the North-Western Provinces was 18,502 in 1878 against 18,309 in 1877, or at the rate per mille of population of 0.60 against 0.59, respectively; and in Oudh 3719 against 13,461, or at the rate of 0.31 per mille against 1.12, respectively. This revived epidemic activity of cholera in 1878 in these provinces is thus shown to have been, on the whole, but little greater than the subsided epidemic prevalence of the disease in the preceding year, whereas in the normal cyclic course of the disease it was due in much greater force in this the first year of the triennial cycle 1878–80. However, such as it was, as represented by the returns, this very slightly revived epidemic activity of cholera in 1878 was coincident with a greatly increased rainfall following upon a year of exceptionally defective rainfall amounting to severe drought, and with scarcity of food amounting to famine (see Table No. V.) The rainfall of 1878, although more than 2¾ inches less than the average, was fully 12 inches more than that of the preceding year.

This sequence of heavy rainfall upon a year of deficient rainfall producing drought, or of drought following upon a year of unusually abundant rainfall, as has been repeatedly pointed out in previous passages, is usually attended

by a more or less distinctly marked increase of epidemic cholera activity, as is well illustrated in the cholera epidemics of 1865, 1867, and 1869 of the former category, and of 1872, 1873, and 1875 of the latter. In all these instances the distribution of the rainfall was such as to leave a period, more or less prolonged, of drought, more or less absolute, either preceding the hot-weather monsoon rains, as in the case of the former category, or following them, as in the case of the latter. But in the case of 1878, as we find, the distribution of the rainfall was not such as to produce these seasonal conditions of drought followed by abundant rainfall, and consequently in 1878 there was an absence of those atmospheric changes of temperature and moisture which depend for their production upon the occurrence of these meteorological conditions; and also there was an absence of the normally due periodic energy of the cyclic revival of epidemic cholera activity. In 1877 the hot-weather monsoon rains were in very great defect, but the spring and winter rains, on the other hand, were exceptionally high above their normal amount, the winter rains especially. So that, really, notwithstanding the great defect in the total rainfall of the year, caused by the failure of the hot-weather monsoon rains, there was no period of drought either preceding or following the hot-weather monsoon rains of 1877. The year 1878, indeed, opened with a fall of 2.69 inches of rain in its first quarter, in continuation of a fall of 6.19 inches in the preceding quarter—the last of 1877; and this was followed by a fall of 4.61 inches in the second quarter, and of 27.77 inches in the third. The fourth or last quarter of 1878 was a period of drought, the effects of which would naturally be felt in the following year. And this, so far as the subject under discussion is concerned, was actually the case. The last quarter of 1878 was marked by a rainfall of only 0.20 inch, and this was followed in the first quarter of 1879 by a continuation of the drought, the rainfall of this quarter being only 0.80 inch. These six months of drought were followed by six months of abundant rainfall, and with the result, as will be seen in its proper place further on, of a revival of the abating cholera, which in its normal course was subsiding from the periodic epidemic activity of the first year of the cycle. These facts afford strong evidence in confirmation of the views I have advanced in previous passages regarding the fixed relation between the effects of rainfall upon the soil and the prevalence of epidemic cholera. In this view of the case there seems no doubt, from the tendency of the facts cited, that the epidemic activity of cholera in these provinces during 1878, notwithstanding the existence of famine in the land, was very largely controlled and mitigated by the peculiar and exceptional distribution of the rainfall, which was such as to prevent the occurrence of any period of drought from the beginning of 1877 until the last quarter of the year 1878.

Comparing the monthly death returns for 1878 with those for the preceding year, the prevalence of cholera in Oudh is shown to have fallen in 1878 to about one-fourth of what it was in 1877, whilst in the North-Western Provinces the disease produced an equal amount of mortality in both years. In the Oudh districts there was no epidemic mortality from cholera during 1878, except in the Fyzabad district, and to a lesser extent in that of Sultanpur also; and in both the epidemic activity of the disease occurred during the last three months of the year.

In the North-Western Provinces the Bandelkhand districts of Jalaun, Jhánsi, and Lalitpur, which for some years past had shown a more or less general exemption from epidemic cholera, were in 1878 visited by the disease

in more than the usual prevalence. In the districts of the Benares division the cholera of 1877 was followed by another epidemic in 1878 of somewhat similar seasonal course, but of much milder fatality in all the districts, excepting Azamgarh, in which the mortality of 1878 was nearly double that of 1877; and Mirzapur, in which it was about the same in both years. In the districts of the Allahabad division the epidemic of 1877 was repeated in 1878, and with markedly increased severity in the districts of Fatehpur and Cawnpore, and with double the preceding year's fatality in Allahabad district; while in Jaunpur and Hamirpur the mortality fell to less than half that of 1877, but in Banda showed a sensible increase. In the districts of the Agra division the cholera of 1878 was everywhere more prevalent than that of 1877; in Agra district the mortality was nearly trebled, and in Muttra also nearly so, while in all the other districts the increase of cholera deaths was very much greater, except in Farukhabad, where it was less than doubled. In the districts of the Meerut division, Aligarh and Bulandshahr show the disease to have been epidemically fatal, the mortality in them rising from 30 and 4 deaths respectively in 1877 to 347 and 309 respectively in 1878; in the other districts, except Dehra Dun, which remained completely exempt from cholera in both years, the increase in the number of deaths registered from cholera was unimportant and trivial. In the districts of the Rohilkhand division the cholera of 1878 prevailed with markedly greater fatality than that of 1877; Budaun returned 81 deaths in 1878 against 22 in the preceding year; and similarly Shâhjahânpur 599 against only 2, Bareilly 1682 against 33, Moradabad 375 against 18, and Bijnor 1300 against 7. In the districts of the Kumaun division a like activity of cholera is shown; the Tarái district in 1878 returned 209 deaths from the disease against none in 1877; the Garhwál district 17 also against none respectively; and similarly the Kumaun district 393 against 13 only. The returns show that the cholera of 1877 was most fatally prevalent in the southern districts of the province, and that of 1878 most markedly so in the northern districts. The figures for 1878 also show that the cholera of that year followed the usual course as to season of epidemic prevalence, appearing early in this form in the eastern districts and late in the western districts; also that the disease, as usual, was generally diffused over all parts of the province, but prevailed epidemically at different periods in its different parts, apparently under the joint influence of climate and local conditions peculiarly favouring its epidemic activity. In the distribution of the cholera of 1878 it is shown that there was excessive prevalence of the disease in 3 circles of Gorakhpur, 1 of Agra, 3 of Muttra, 1 of Cawnpore, 1 of Benares, and 1 of Moradabad, as well as in some of the other districts. In reference to this, Dr. C. Planck observes that—

"The scattered position of the localities so principally affected tends to support the belief that the intensity of the prevalence of cholera is dependent on certain conditions of locality favourable to its development under the influence of particular states of the atmosphere."

During the year 1878, out of a total of 117,630 centres of population in the North-Western Provinces, only 4237, or 3.6 per cent., reported cholera; and in the ten districts most severely affected, with a total of 29,638 centres of population, cholera deaths were reported from only 1677, or 5.6 per cent. In the districts of the Kumaun division, where cholera was unusually prevalent during the last three months of 1878, the distribution of the disease is thus recorded:—In Tarái district, out of a total of 594 towns and villages, 46 were

affected by cholera, 35 of the number returning from 1 to 5 cholera deaths, 7 from 5 to 10, 3 from 10 to 20, and 1 more than 20 deaths, viz., the village of Sunpahar, in the Bilhari circle, which returned 23 deaths; in Garhwál district, with a total of 4203 towns and villages, only 17 reported cholera, viz., 16 returning from 1 to 5 deaths, and 1 from 5 to 10 deaths; in Kumaun district, with a total of 6346 towns and villages, 103 were affected by cholera, of which number 84 returned from 1 to 5 deaths, 13 from 5 to 10, 5 from 10 to 20, and 1 more than 20, viz., Kaladungi, which returned 31 deaths.

Regarding the meteorology of the year 1878 in these provinces, the principal feature appears to have been the distribution of the rainfall as compared with that of the preceding year, the peculiarities of which have been already referred to.

Regarding the food-supply, as before stated, prices of the principal food-grains ruled very high, and verged upon famine rates. The very high prices commenced in the last quarter of 1877, and continued to the middle of 1878. The average of the means from December 1877 to June 1878 is stated to have been 14 sers the rupee, the average of the means for the seven years 1870–76 being 24½ sers the rupee. High prices of grain continued throughout the year, and in some parts of the provinces the rates were considerably above the average, and there was some distress among the poorer classes, but no actual famine scarcity was felt. In connection with the relation of food-supply to the public health Dr. Planck observes—"It is worthy of remark, as a record in proof of the value of the canal irrigation as regards the general prosperity of the people influenced, that the five irrigated districts of the Meerut division provide a comparatively low ratio of mortality in 1878. Their mean ratio is 33.03 per 1000 of the population, which contrasts favourably with the mean ratio of the five Rohilkhand districts, 48.64."

1879.—In this year cholera, instead of abating from the prevalence of the preceding year, continued active at about much the same rate of prevalence; that is to say, it was a mild cholera, such as was normal to the second year of the cyclic period, the epidemic activity of the disease in the first year having been checked in its full development by the peculiarities of season previously referred to. The cholera death-rate in 1879 among the civil population was 0.81 per mille against 0.80 in the preceding year. The total number of cholera deaths registered among the civil population of the North-Western Provinces was 30,621 in 1879 against 18,502 in 1878, or at the rate per mille of 0.99 against 0.60, respectively; and in Oudh 5271 against 3719, or at the rate of 0.44 against 0.31, respectively. This epidemic prevalence of cholera in these provinces during 1879 was coincident with a very unusually abundant rainfall following upon a year of less than average rainfall, and with a continuance of high prices for food (see Table No. V.) The rainfall of 1879 was 16 inches in excess of that of the preceding year, and it was 13 inches also above the average; the excess was distributed over the last three quarters of the year, but was most marked in the third and fourth. The first quarter was one of drought, and it was preceded by a like season of drought in the last quarter of the preceding year. The epidemic cholera of 1879 commenced, and attained its greatest intensity, during the first heavy falls of rain in the second quarter, and slowly abated in prevalence during the more abundant falls in the third quarter (see Table No. II.) Much of the cholera mortality of the year occurred among pilgrims visiting the great *Kumbh Mela*, or "Twelfth-year Fair," at Hardwar.

Comparing the monthly death returns for 1879 with those for 1878, the figures show that the cholera of 1879 had acquired a considerably increased

prevalence over that of 1878 in both the North-Western Provinces and in Oudh, the amount of this increase being about proportionally equal in each, but the distribution of the increased prevalence being very unequal in their several districts. In the Oudh districts the cholera of 1878 prevailed epidemically in Fyzabad and Sultanpur most severely, and in Partabgarh, Lucknow, and Gonda with less severity; the cholera of 1879 affected these districts very slightly, with the exception of Gonda, where the mortality was more than quadruple that of the preceding year, but prevailed with epidemic severity most severely in Kheri and Bahraich, and less severely in Bara Banki and Sitapur, and in Unao still less so. In all the other districts there was a marked subsidence in the cholera mortality of 1879 as compared with that of 1878, except in Hardoi, where there was an unimportant increase. In the Bandelkhand districts of the Jhánsi division the cholera of 1879 was confined to the Jalaun and Jhánsi districts, the mortality in the former being considerably less than half that of the preceding year, but in the latter nearly treble as great; while in Lalitpur the severe epidemic of 1878 was followed by complete immunity from the disease in 1879, only a single death from cholera, in April, being registered throughout the year.

In the districts of the North-Western Provinces there were similar differences in the prevalence of cholera in the two years compared, as will be seen by reference to Table No. I. It may be noted here, however, with reference to the outbreak at Hardwar to be described presently, that in the Rohilkhand districts there was a very marked decline in the mortality from cholera in 1879 as compared with 1878 everywhere, and most markedly in Bareilly, except in Budaun, where the mortality was quadrupled. In the Kumaun districts, on the other hand, the cholera of 1879 was unprecedentedly severe, and the mortality by far the greatest of any ever recorded in this division; the mortality in Tarái was treble that of the preceding year (619 deaths to 209); in Garhwál it rose from 17 deaths recorded during November and December 1878 to 3473 recorded in 1879; and in Kumaun the epidemic of 1878, which produced a registered mortality of 393 deaths, was in 1879 continued into a fresh epidemic, the registered mortality from which amounted to 6894 deaths.

In 1879, as usual, cholera attained its period of greatest activity in different months in the different districts, and this even in different districts of the same division, at least in some instances. In the Oudh districts the periods of highest mortality ranged from June to November. In the Benares districts from April to October; in the Allahabad districts the same. In the Agra districts from April to June; in the Meerut districts the same, with a second period during September and October; and in Rohilkhand the same two periods. In Kumaun the period was April to June in respect to Kumaun and Garhwál districts, but September and October in respect to the Tarái district. This early appearance of epidemic cholera in these northern districts in this year is described in the Sanitary Report for the North-Western Provinces for 1879 as "a most unusual circumstance," and by some advocates of the theory of cholera diffusion by human agency this early and violent manifestation of the disease in the Kumaun districts has been connected, in the relation of cause and effect, with the great Hardwar fair held in April of this year. Their argument, however, is based on false premisses. A reference to the monthly mortality returns for past years shows that the epidemic appearance of cholera in the Kumaun districts (as has been noted in previous pages) during April, May,

June, and July, instead of being "a most unusual circumstance," is, on the contrary, quite in accordance with the usual epidemic manifestations of the disease in these districts.

The records of the past years of death registration in the North-Western Provinces show that in 1873, and again in 1876, as in 1879, the Kumaun districts were visited by cholera, which prevailed epidemically during the same early months of the year. The cholera epidemic of 1873 in Kumaun, which really commenced in December 1872, attained serious epidemic fatality as early as February, attained maximum fatality in April and May, sensibly declined in June, and abated in July, but lingered on until October, in which month a single death recorded marks the final cessation of the disease in that year. Again, the epidemic cholera of 1876 in Kumaun district is shown to have commenced in April, to have rapidly increased in May, attained its maximum in June, to have declined in July, and suddenly fallen in August to a very mild degree of fatality, and finally to have ceased in October, no cholera death being recorded in the two following months. The cholera epidemic of 1879 in this Kumaun district was in reality a continuation of the disease prevalent in it during the preceding year, at the close of which it had attained something like epidemic activity, no less than 200 out of the total 393 cholera deaths of the year having been registered in the month of December. During the first three months of 1879, however, there was a very marked subsidence in the activity of the disease, the deaths registered being only 25, 19, and 21 respectively; but in April the epidemic burst out with great violence, and the deaths bounded up to 1355; in May the epidemic culminated with 3012 deaths in that month; in June the number fell to 1987, and in July to 367, and in August the mortality ceased with 108 deaths registered in that month. The cholera mortality recorded in this district during 1879 is, so far as our statistics testify, exceptionally high; but it is in accordance with the exceptional circumstances of the year in this district. There were large numbers of pilgrims in movement going to and returning from the Hardwar fair, and it is ascertained that they suffered from cholera both in going to Hardwar and returning from thence, but most severely during and after the return journey, in the months in which the disease, as is shown by the records of past years, is usually most fatal when in epidemic prevalence. The fact of unusually large numbers of people journeying on pilgrimage during this season of epidemic cholera accounts fully for the unusually high cholera mortality of 1879 in these districts. That the increased mortality of 1879 is due to the epidemic influences of climate and locality combined is evidenced by the different incidence of the mortality in the different districts, both as to time and place. Thus the epidemic influences producing cholera were most powerfully active in the Kumaun Hills during April, May, and June, less powerfully active during the same months in Garhwál, and least so in Tarái. On the other hand, in this last named district the cholera-producing influences became more powerfully active during the months of September, October, and November than they were in the earlier three months above named; while in the other two districts these influences had entirely ceased to operate during the later three months. In other words, the records show that the cholera-producing influences, which were most active in Kumaun at the time the crowds of pilgrims were moving through the district, were least so in the Tarái district when its roads were thronged by pilgrim bands; and that later, when both districts were free from roving pilgrims, the cholera-producing influences again became active in Tarái, and to a markedly greater extent of mortality than at the

time when its roads were crowded by pilgrims, but manifested no signs of presence or activity either in Kumaun or Garhwál at the same period.

As the outbreak of cholera at the Hardwar fair in 1879 has been very generally accepted as the starting-point whence the disease was carried away by the dispersing pilgrims, and by some is held to have been the direct cause of a widely diffused cholera epidemic in the Punjab Province during the succeeding months of the year, it will be convenient in this place to relate the principal circumstances which have been recorded in connection with the appearance of the disease at Hardwar during the *Kumbh Mela* of 1879.

The main physical features of the site of Hardwar, and the peculiar sanctity of the *Kumbh Mela* held there every twelfth year during portions of the months of March and April, as being a more convenient arrangement, will be briefly described hereafter in the account of this year's cholera in the Punjab Province. In this place it will suffice to say that the Hardwar fair takes place annually, the gathering of pilgrims there lasting from about the 15th March to the 15th April, but that on every twelfth year the religious ceremonies performed there are held to be of peculiar sanctity, and attract unusually large numbers of pilgrims from all parts of the Hindu world.

For the comfort, safety, and good behaviour of the vast multitudes assembled together on such occasions suitable and careful provision is made by Government in respect to the victualling, sanitary, medical, and police arrangements at the fair itself; and in these respects there is no doubt that the Hardwar fairs, whether *Kumbh* or ordinary, are now held under far more favourable conditions for preserving the public health than was ever the case before the establishment of the British rule, or even during the earlier years of British supremacy. The conditions affecting the people assembled at the fair which are under control and capable of management now receive the fullest and most painstaking attention; but there are some very important conditions of this nature which are not under control, namely, vicissitudes of weather, and the exposure of the people to those atmospheric changes under most unfavourable circumstances as regards house-shelter, bodily clothing, and daily food, irrespective of the effects of mental excitement, bodily fatigue, and not infrequently religious ecstasy.

The town of Hardwar is described as "hemmed to the west by the Sewalik Mountains, between which and the Ganges the town is thrust on land sloping from the mountains to the river, the town filling nearly all the interval." Among the outer spurs of the mountains are ravines, the chief of which was habitually frequented as an easing-ground by the townspeople and their visitors, and when taken in hand by the police, preparatory to the great assemblage, was "found in a state so disgusting as to make approach to it difficult." Many houses in the town, also, were extremely overcrowded, such shelter being preferable to camp-life, "as the wind blows coldly from the mountains at night-time, and change of weather, bringing rain, is a probable occasional occurrence at Hardwar while the fair lasts." It is stated that in one house, affording proper accommodation for, perhaps, 25 persons, there were counted 152 on the 23d–24th March.

The state of the water of the sacred pool is thus described by Dr. C. Planck, the Sanitary Commissioner for the North-Western Provinces and Oudh, from whose "Sanitary History of the Hardwar Fair of 1879," given in Section V. of his Sanitary Report for the North-Western Provinces and Oudh for 1878, the following particulars are derived :—

"Near to the steps the water was seen to be almost stagnant, its colour milky-gray, the result of constant agitation by the continuous stream of bathers, who not only dip themselves, up and down, in the water as they pass through the pool, but open little parcels of ashes and spiculæ of bones of their relations who have recently died, and mix the contents with the water. Or they carry little offerings of red and yellow flowers,

or sugar, or even a vessel of milk, to throw into the water as they enter it. Hardly any person goes in empty-handed. This continual agitation and mixture of ashes and offerings had resulted in giving to the water an appearance of extreme unwholesomeness, which seemed to require remedy; and more especially as, for effectual cleansing from sin, internal as well as external washing is deemed requisite. To effect this internal washing the pilgrims must drink the water, which they do earnestly by handfuls; and friends give each other of the water to drink; so that, altogether, a considerable quantity finds its way into the bodies of most pilgrims."

As to the sanitary defects of the place, "the desired changes were effected as soon as possible by the authorities present, under the orders of the Magistrate. The houses of the town were visited by the police, and their excessive population thinned to reasonable limits.

The stream under the steps of the sacred ghât (the sacred pool above mentioned) was quickened by deepening the entrance-way of the water, with a very favourable result.

The use of the kiln (for consuming the human ordure) was discontinued. Trenches like pits were provided in a ravine of the Sewaliks having the necessary depth of soil, for the immediate burial of the impurities formerly burnt.

The urgent necessity for insuring the reality of the measures established for the good sanitary management of the assemblage was brought home forcibly to the minds of all concerned by the occurrence of a case of cholera disease on the 24th March, in the person of a man well known to the authorities present. Before that day no case had been heard of, or probably had happened; for the entire police force, scattered in all portions of the site, were on the watch for it, with strictest orders to bring for treatment any person found seriously ill, doolies being provided for that purpose at every station. This *first* case was that of a man named Harnám, part owner of a large house overlooking the sacred bathing-steps; and the English officers present at the fair had been used, with the owner's permission, to watch and control the bathers from the flat roof of this house. Harnám was particularly polite and attentive at such times, shading the officers with an umbrella, and in other ways promoting their comfort—attentions last given on the 23d March to Dr. Cuningham and the Magistrate."

On the morning of the 24th March Harnám was taken to the cholera hospital, when the following history was recorded by Dr. Planck:—"Name, Harmán; Brahmán; aged 45; came from Auritsar four months ago to help his brother to manage the pilgrim lodgers at their house above the bathing-ghât; has lived in that house ever since he arrived, and never left the house for the last seven or eight days, excepting to bathe daily in the sacred pool; used a latrine at the top of the house, which was cleaned daily by a sweeper; cooked and ate food in the house. Yesterday morning attended gentlemen on the house-roof. After their departure worked all day for the management and control of the pilgrims in the house, about 150 in all. Ate once only, at one o'clock in the day, a meal of múng-dál and wheaten bread. Felt quite well all day; smoked tobacco, laughed, and talked as usual. About four o'clock in the afternoon drank a lotahful of water taken from the Ganges, well out in the clean stream, with a gharrah kept in the house. Five other persons of the family ate of the dál and bread with him, and his brother drank a lotahful of water at the time he did, taken from the same gharrah. At seven o'clock in the evening, at brother's request, lay down to sleep near the doorway whilst he watched; at about ten o'clock brother lay down beside him, and both slept. At about one o'clock in the morning Harnám awoke, went up to the top of the house and was purged; returned and lay down again beside his brother, but feeling ill could sleep no more. Soon had to go up to the top of the house again, and was purged; came down feeling sick; then woke brother, who handed him vessel, and he vomited into it. Has been purged five times and has vomited eight times altogether; and the police, hearing of his illness, came to see him soon after daylight, and took him away in a dooly to this place. The poor man was suffering from genuine cholera morbus

with changed voice, great thirst, almost no pulse, and cramps of the hands and legs, and he died about twenty-four hours after first attack. As a precautionary measure, the house in which he had lived was vacated by its numerous inhabitants, closed up, and fumigated with burning sulphur. The brother, who attended the sick man closely and tenderly during all the time of his illness, and the other members of the family, were kept under surveillance, in a hut near to the hospital, for four days. They all remained well, and were perfectly well at the time I left Hardwar, on the 16th April, and no one of the 150 pilgrims who lived in the house were taken ill at Hardwar."

On the next day, 25th March, a *second* and a *third* case were brought to the cholera hospital.

The *second* was a sweeper, aged 30, of Dudli, in Muzaffarnagar district, who had come to Hardwar fifteen days previously, under the Magistrate's orders, for employment as a sweeper; "was employed at first for eleven days to clear the jungle, then for the last four days to the charge of a trench-latrine at the entrance to Hardwar near the Lalta Rao. Has never slept in a house since arrival at Hardwar; for last four nights has slept under a tree near to the latrine. Has never visited the sacred bathing-ghât; has drunk Ganges water only, taking it from the part of the river nearest to his latrine; sometimes bathed in the Ganges, but not for the last two days. Last night, at eight o'clock, ate rice and dál and bread bought ready cooked at a shop; at the same time took some vinegar given to him by a chaprasi, who thought it was bad. Thinks this vinegar caused his illness; has brought the bottle containing some of it for examination. Slept after eating, but woke about one o'clock this morning, and was purged many times afterwards and sick once; and the police, finding him ill, have brought him to hospital. The vinegar in the bottle was a thick yellowish-brown fluid, probably decaying vegetable matter in water, with a sour smell, but in no respects resembling vinegar, as the man allowed. He . . . had taken about a wine-glassful of it, hopefully. . . . The taking of this unwholesome fluid may have been the cause of this man's illness. If so, it had produced a condition analogous to the first stage of cholera—quickened pulse, sunken eyes, a whispering voice. But no condition of collapse supervened, and the man made a speedy recovery."

The *third* case was that of an old beggar, aged 60, "who stated that he came to Hardwar twelve days ago, and had stayed all the time at Kankhal. Was taken ill during the night of the 22d March with purging, and had been purged often since; but no one cared for his illness. Being unable to walk about and beg, the police have brought him to hospital. He presented the appearance of a man recovering from cholera, his fingers shrivelled and eyes sunken. But his kidneys were performing their function, and he recovered. . . . The man knew no cause for such illness, having eaten only good food before going to sleep on the evening of the 22d."

On the following day, 26th March, a *fourth* case was brought to hospital—

A Chaube Brahmán of Muttra, aged 60; came to Hardwar eight days previously to make sweets for a sweetmeat seller in Kankhal bazar; had lived with his employer, and worked at his business ever since arrival; "bathed on the first day at the sacred ghât, but not since. Had been quite well until four o'clock this morning, when he woke with twistings in the belly, was purged eight times and vomited twice; before going to sleep, at eleven o'clock last night, ate four puris" (wheaten cakes frittered in oil or butter), "fresh and good, such as they sold during the day; drank Ganges water only; slept in the same room with four other men; purged and vomited on the floor, the result being afterwards swept up and thrown out on the road." On admission to hospital he had "severe cramps of hands and legs, suppressed urine, feeble voice, a pulse just perceptible—a genuine case of cholera morbus." Eventually he recovered. "He had slept, and been taken ill, in a small unventilated room of a masonry-built shop. The other inhabitants of the house were found all well. The four other men, who slept on the floor of the same room, were seen to be all well. The shop and room were emptied, thoroughly washed over with clay-water, and fumigated."

Again on the following day, 27th March, a policeman, aged 21, a fine strong man, was admitted to hospital with the following history:—

"Was employed during the night of the 25th on sentry duty at the reserve lines near Lalta Rao from 2 to 4 A.M.; then slept in his tent with other men; bathed in the Ganges at the Rao at 9 A.M.; afterwards ate bread, dál, and gúr" (coarse sugar), "and

drank about a seer of Ganges water; at 12 noon was purged, visiting the Sepoys' latrine; purged many times all the remainder of the day and during the night; suffered from thirst and drank water belonging to another policeman; went on guard from 12 to 2 A.M.; vomited twice after coming off guard; then slept until four o'clock, when he was purged twice, and being ill with such disease, was brought to the cholera hospital. His condition was favourable—voice feeble, no cramps, motions yellow, urine secreted as usual, pulse nearly natural. It was apparently a case of severe diarrhœa, caused, the man believed, by the coarseness of the flour he ate on the morning of the 26th. The man quickly recovered. The tent was visited, removed to another place, and its site covered with earth. Of all the considerable body of men at the reserve lines, no other person was taken ill."

The next case, the *fifth* case of cholera, was admitted on the 30th March:—

An old beggar-woman, aged 60; "came to Hardwar fifteen days ago from Taska, in Manglour; lived all the time at Kankhal; begged in the day and slept in the gardens at night; was well until last night, when she was taken suddenly with purging and vomiting at 1 A.M.; ate only wheaten bread before going to sleep; found ill in the garden by police, and brought to hospital at 6 P.M. of the 30th. Has no pulse, complains principally of pains in the belly, colic-like; has cramp in one leg, feeble voice. Probably a case of cholera; but the patient lived for several days in hospital, and her principal symptom was colic-like pain."

For nine days after this no case of cholera presented itself, when, on the 8th April, four cases were brought to hospital, and several others occurred at Hardwar.

Of these four cases, the first was that of a Brahmán, aged 25; "came from Jammu, in the Punjab, by rail to Saharanpur, one of a party of fifty-five Khatris and Brahmáns; taken ill yesterday at Bhagwanpur, with purging and vomiting, but marched on 18 miles to Hardwar, being purged and vomiting several times on the way; on arrival was brought to hospital by the police. This was a case of genuine cholera disease, with the usual urgent symptoms, and the man died."

The next case was that of a Thakur, aged 40; "came from Silpar village, 10 miles east of Almora, in Kumaun; taken ill at Bárapura, in the Bijnor district, three marches east of Hardwar, at 1 A.M., three days ago, when he was purged once. During the first day's march was purged five times; slept at night to 12 P.M., when he was purged again; during second day's march was purged four times; slept again, but woke soon by the continued purging, by which his clothing was spoilt; marched one *kos*" (1½ mile) "on the third day and vomited twice, and could march no more; was then carried alternately by his brother and brother-in-law on their backs to Chandi, on the Ganges bank, opposite Hardwar, a distance of about four *kos*, and taken to the hospital there; from Chandi he was transferred in a dooly, without delay, to the cholera hospital on the Hardwar side. The brother and brother-in-law left him to bathe at the sacred pool this morning. Was one of a party of nineteen persons who came from Silpar, of whom only 'he' was taken ill. This was a case of genuine cholera; . . . and eventually ended in death, four or five days after admission."

With this case, it is stated, "came another case, also from the Chandi side, of a fat young woman, perhaps 20, whose husband had run away. She was moribund from cholera disease, but known to be a hill woman from her necklaces and ornaments. No history could be got from her."

Shortly after the admission of these two cases, the fourth admitted on this day, occurring at Hardwar, was brought from the Chandi side. "A Brahmán, 35, arrived at Chandi two days ago from Bhagal, in Srinagar, Garhwál; bathed this morning in the Ganges, and was taken ill afterwards with purging and vomiting; and at the same time news was brought that several persons were ill at Chandi."

Chandi is the name given to "an extensive site of hill and sand on the east bank of the Ganges." The Chandi Devi temple tops one of the hills there, and, as is stated, is one of the holy places which pilgrims to Hardwar should visit. No centre of population "easily seen exists there." As a rule, pilgrims from the Garhwál and Kumaun Hills and from the Bijnor district camp on the sand and in the ravines of Chandi. "A police force had been

established there, a bazar opened, a hospital erected, and latrine enclosures provided. At no time had any great assemblage of people come together there, and being distant from the fair site proper, the place had not attracted much notice." Dr. Planck, visiting the site on the 8th April, noticed the following conditions:—

"A narrow strip of sand, backed by low hills, and fronted by the shallow Ganges stream. A few shops on the sand close to the hills. People encamped in the shallow ravines, which were overgrown with bushes, thinly scattered. The people mostly sheltered under the bushes in groups of families separately. No approach to overcrowding anywhere, or any appearance of crowd; probably not more than 10,000 people in all scattered over the extensive site, which was clean everywhere. In the northern portion of the site is a wide ravine, evidently at times the bed of a stream in the rains; its surface sand and boulders, with here and there higher portions carrying bushes. The bed of this ravine and its bank on both sides were in possession of parties of hill people from Kumaun and Garhwál, who appeared to have selected this place for their especial accommodation. The people of Bijnor and other trans-Ganges plain districts were noticed to have accommodated themselves in the ravines and sandy places extending southward of this temporary abode of hill people, and quite separate from them. Inquiring carefully, it was found that an outbreak of cholera disease of very serious proportions was progressing in this ravine of hill people, and amongst these people only. Unfortunately the road to the much-frequented Chandi Devi temple passed up one side of this ravine; but as yet there had been no known case of the disease amongst plains people at Chandi. And, I may add, no such case happened at any time."

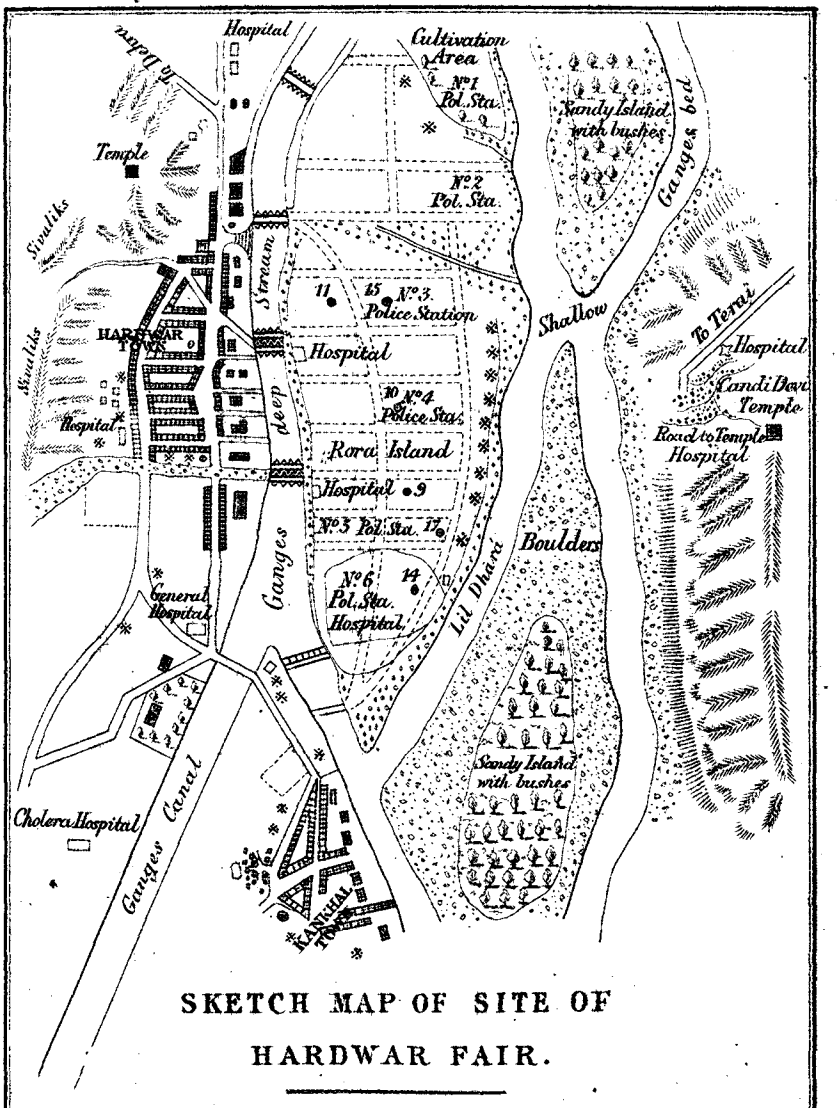
But, continues Dr. Planck—

"Searching amongst the hill people, very soon twenty cases of cholera, in all stages of that cruel disease, were gathered around the partially constructed hospital," which had been immediately established here. "Many of these persons were moribund and speechless, and having been abandoned by their friends, their histories could not be recorded. . . . Only three things were learnt for certain—(1.) That the hill people had seen persons suffering from cholera on the roads leading to the fair as far back as the foot of the hills. (2.) That some of the cases had commenced before arrival at Chandi and some after arrival. (3.) That cases of the disease were present at Chandi as early as the 6th April, but had not been reported, perhaps not known to the police."

It was now "determined to disperse the assemblage there to their homes, and to prevent the passage of people from the Hardwar to the Chandi side of the Ganges, and *vice versâ*."

These measures were carried out on the 9th of April; . . . and by the 10th only the sick and a few members of the police guard remained there. To prevent the crossing of people from Chandi to Hardwar, or from Hardwar to Chandi, was not easy. Many people on the Chandi side wished to bathe in the sacred pool at Hardwar before departing for their homes, and many people on the Hardwar side wished to visit the Chandi Devi temple. I think the latter were entirely prevented from carrying out their desire by the cordon of police established in the Ganges bed along the line of the Lal Dhara, or shallow Ganges stream, a little more than knee-deep anywhere, this precautionary measure being urgently demanded by the fact that the immediate locality of the roadway leading to the temple had been a place of excessive prevalence of cholera. Several persons dead of the disease lay on or near the road, the bodies hidden amidst the bushes, and discoverable for burial only after careful searching of the locality, the friends having fled away and left the sick to die, or after death had occurred. I think the crossing of people to the Hardwar side was not so effectually prevented, indeed could not be. . . . Certainly groups of hill people were seen at the sacred ghât on the 12th. . . . As the result of this measure the cases of cholera at Chandi were restricted to 61, all collected during the 8th, 9th, and 10th of April, all hill people from Kumaun and Garhwál, and all found in and about the ravine before described. After the 10th no new case occurred at Chandi, probably because there were few people to be affected there. Of these 61 persons 42 had died by the 12th April, and of the remainder about half were dangerously ill and half convalescent."

Notwithstanding the occurrence of all these cases on the Chandi side of the river, "no new case occurred in the fair site proper until the 11th April,



SKETCH MAP OF SITE OF HARDWAR FAIR.

Note: Copied on a reduced Scale from the Sketch Map accompanying Dr C. Planck's history of the Hardwar cholera in his Sanitary Report for the North Western Provinces for 1879.

• *Marks locality of cholera.*

※ *Locality of trench latrines.*

Vincent Brooks Day & Son, Lith.

Trubner & Co. London.

when an *eighth* case, occurring at Hardwar, was admitted to the cholera hospital."

A Brahmán beggar, aged 45, old-looking and broken down, arrived at Hardwar from Gurdaspur on the 6th April; slept on the ground for the five nights near to the Myapur Canal bridge, and begged in the day; taken ill last night about twelve o'clock. Is suffering from cholera; the symptoms, however, not very urgent. This man recovered.

On the same day the *ninth*, *tenth*, and *eleventh* cases were admitted, as follows:—

(1.) Old man of Etah; arrived at Hardwar on the 8th April; lived in camp for three days in No. 5 police area on Rora Island, and was taken ill there this morning at 2 A.M. Urgent cholera disease, ending in death. (2.) A woman, arrived at Hardwar on the 9th from Rampur village, in Najibabad pargana of Bijnor; camped on Rora Island, in No. 4 police area, and taken ill there about daybreak this morning. Cholera, ending in death. (3.) An unknown man, brought moribund from cholera from No. 3 police area."

"On the 12th April, the auspicious day of great bathing, the *twelfth* and *thirteenth* cases occurred, in a man and woman camped amongst the people of Dehra Dun district, near to Bhimgoda, north of Hardwar town. They were taken ill with cholera early in the morning, and carried in doolies through the crowded Rora Island site to the cholera hospital, and were both moribund on arrival there."

"On the 13th April the assemblage was fast breaking up, continuous streams of people passing away in all directions from the fair. On that day the *fourteenth* case was brought from No. 6 police area, the *fifteenth* case from No. 3 police area, the *sixteenth* case from the centre of Hardwar town, and the *seventeenth* case, a syce of cavalry detachment camped in No. 5 police area—all cases of cholera, and all fatal. During the night of the 13th ten cases were admitted, brought from all portions of the site."

"Active measures were taken to cause the perfect vacation of the Rora Island site, and by the evening of the 14th all the crowd of people assembled there had departed. During all that day cases of cholera disease, to the number of *twenty-seven* in all, were admitted to hospital. Cases were brought from all portions of the fair site, and from the towns of Hardwar and Kankhal, and some were persons who had commenced their homeward journey. . . . Some were hill people from Kumaun and Garhwál. By the 15th April all the pilgrims had departed, and no more cases were admitted. But the disease lingered amongst the townspeople of Hardwar and Kankhal, and these cases, 111 in all, were treated in the municipal dispensary or hospitals."

"The prevalence of disease at the fair may be learnt by the following return of admissions to all the hospitals from the 14th March to the 14th April:—

Diseases.	Admitted.	Discharged.	Died.	Remaining.	Total.	Remarks.
Fever	37	29	...	8	37	From the 14th to the 30th April 111 cases of cholera were admitted to the dispensary and hospitals of the Hardwar neighbourhood.
Lung affections .	32	19	8	5	32	
Bowel diseases .	38	25	7	6	38	
Cholera. . . .	117	5	70	42	117	
Accident . . .	16	9	2	5	16	
Other diseases .	57	46	6	5	57	
Totals . .	297	133	93	71	297	

With regard to the three first-mentioned forms of disease, it may be seen," by reference to the account previously given of the cholera outbreak at the Hardwar fair of 1867, "that their prevalence in 1867 was far greater than in 1879, and this may have been due to the difference of weather during the two fairs; for whereas in 1867 the weather was unsettled, with occasional storms and rain, in 1879, although for several days while the fair lasted the sky was clouded over, yet, with the exception of a scanty shower in the early morning of a day at the beginning of April, there was no rain or any storm." The prevalence of cholera, it will be seen, was greater in 1879 than in 1876. The disease in 1879 was scattered pretty equally over the Hardwar site, as is shown in the sketch-map (given on a previous page), copied, on a reduced scale, from that given in Dr. Planck's history of the cholera outbreak at the Hardwar fair of 1879, on which are marked, "with approximate correctness, the spots where the patients slept on the night of the attack, in the first fifteen cases seen on the Hardwar side, Nos. 6 and 7 of the series of seventeen referring to cases which occurred on the Chandi side."

Dr. Planck observes that—

"Without exception in the history of the cases recorded, there appeared this fact, that the patient had been quite well all the day preceding attack—had gone to sleep as usual—had been waked in the night by the onset of purging—and this symptom continuing, had speedily fallen into a condition threatening death, only too often realised. Whenever the case was one of genuine cholera the patient could assign no reason for the attack—apparently something of the nature of virulent poison had affected the patient as he slept. But how or why an agent or poison so immediately deadly in effect should operate only on one man out of hundreds sleeping on the same plot of ground, or in the same house or neighbourhood, is, as yet, incomprehensible; unless, indeed, upon the understanding that cholera attack is due, if to any external agent, then to one only able to affect persons in some unknown state of health or condition of life. That this state, or condition, is not a common circumstance appears amply shown by the history of this outbreak. I think it is no exaggeration to estimate the number of persons who came to Hardwar from beginning to end of the fair at 800,000, omitting those who came to Chandi" (estimated, in a preceding passage, at about 10,000). "Amongst this great number of persons 56 cases of cholera were recorded, or one in 14,285. That it is not due to insanitary conditions, commonly so called, seems amply proved. The only insanitary condition worthy of notice and condemnation at the fair was the overcrowding at night-time in the houses of Hardwar and Kankhal. The first, fourth, and sixteenth cases recorded did, indeed, occur in these overcrowded houses; but the remaining 12 cases in which the place of attack was recorded occurred in persons who slept in the open or under imperfect shelter. And all the 61 cases at Chandi occurred in persons so situated."

"It seems hardly possible to suppose that this condition results from fatigue of over-marching, for all the first six persons attacked had been at Hardwar a sufficiently long time to have quite recovered from any fatigue the result of travel. It is equally impossible to believe that the drinking of Ganges water caused the attacks of the disease in question, for it is certain that almost all the pilgrims drank it; yet only one in about 14,285 suffered from cholera." It is very possible, continues Dr. Planck, that some of the matters vomited and purged by the first case of cholera recorded, which "occurred in a house margined by the Ganges, and standing at the very border of the sacred bathing-steps," may have found their way into the water of the sacred bathing-pool. "Yet, though hundreds of thousands of persons bathed in and drank the water of the pool between the 24th March (the day on which the first case recorded occurred) and the 11th April, only five cases of cholera disease occurred in all the intermediate seventeen days in the fair site proper. And of these there was distinct evidence that the patient had not bathed at the sacred pool, and two were old beggars not likely to have done so. It is quite certain that the depressing influence and general misery resulting from rainfall cannot be cited as a possible cause of the predisposing state of health or condition of body on this occasion, for there was no rainfall sufficient to be cause of complaint during all the time of the fair. The weather was cloudy and rain threatened at times from the 26th March to the 4th of April, but the clouds cleared off without rain or storm; and from the 4th April to the end of the fair time the weather was clear and hot, with west wind. If there was any reason for complaint as regards the weather, it was on

account of heat, but that even not to such an extent as would be likely to make a native of India complain."

"In all the history of this cholera prevalence not one fact was elicited in support of the opinion that cholera is a contagious disease, that is, likely to attack a man simply for the reason that he is brought into contact with another man suffering with the disease. The map shows how the cases were scattered. Indeed, with the exception of the Chandi ravine site, no two cases occurred in the same place. No person of the police brought into contact with cholera patients, no dooly-bearer who lifted and carried the patients, no hospital attendant or servant who ministered to the sick and buried the dead, no friend or relation who accompanied and stayed with the patient until he died, was attacked with the disease. So far as I know, no one of these numerous persons suffered at all in consequence of contact with the sick, often close and continuous."

The homes of the 117 persons attacked with cholera were recorded. The list shows that the people attacked came from places widely distributed over the map of Northern India, but chiefly from the mountainous country of the Himalayas. With reference to this point, it is necessary carefully to consider all that is known concerning the prevalence of cholera in the North-Western Provinces and the Punjab during the months immediately preceding the assemblage of pilgrims at the Hardwar fair.

As regards the North-Western Provinces, the monthly mortality returns for 1878 and 1879 show that cholera was present in no less than 17 districts from December 1878 to March 1879, both inclusive, that is, for four months preceding the fair, and that the disease was persistently prevalent in the Kumaun district throughout these four months. Regarding the 10 deaths registered in Saharanpur district during December 1878, it is recorded that they "all occurred in a village of the Ganges Khadir" (or periodically inundated land) "about 25 miles below Hardwar, and inquiry showed that 18 cases in all occurred at that village between the 20th and 31st December." The presence of cholera in Muttra in March is also noteworthy in connection with the *fourth* case of cholera recorded at Hardwar. The returns show that the cause of cholera disease was present in many parts of the province before the Hardwar fair commenced, and that the appearance of the disease at Hardwar on the 24th March was probably quite independent of the assemblage of pilgrims there. It seems likely, indeed, that the pilgrims, in assembling at Hardwar, were coming to a locality in which cholera might have prevailed in April altogether independently of their arrival. The first case observed, it will be remembered, occurred in a man who had lived in the town for four months; and the disease prevailed at Hardwar throughout April, after the pilgrims had left the place. That the outbreak of cholera at Hardwar in April was altogether independent of the assemblage of pilgrims there—although undoubtedly the vast concourse of people brought together on its limited area afforded a greater number of possible victims to the disease—is, moreover, clearly shown by the monthly mortality returns for 1879. These show that April was the month in which cholera became markedly active throughout the districts of the North-Western Provinces and Oudh. The district of Kumaun is the only one in the whole list of districts which shows cholera actively prevalent during the first three months of the year. Everywhere else in the united provinces the cholera of 1879 was either completely quiescent or at a minimum of prevalence during these three months. Only in the widely parted districts of Fyzabad, Benares, Banda, and Mirzapur did the disease commence to manifest activity before April, and in each of them this commencement of activity took place in March.

With this widely diffused activity of cholera commencing to assume epidemic form, the pilgrims from Hardwar were dispersing to their homes in all parts of the country, and many of those travelling on the roads fell under

the influence of the generally increasing prevalence of the disease—a circumstance which has given rise to the belief that they themselves spread the disease, and were the direct cause of its epidemic prevalence. A similar increase of cholera mortality was observed after the dispersion of the pilgrims from the *Kumbh Mela*, or Great Hardwar Fair of 1867, and, as on the later occasion, so then also, the increased cholera prevalence was attributed in many places to the importation of the disease by pilgrims, who, it was assumed, carried the disease about with them, and spread it broadcast all over the country. A careful examination of the provincial death returns, however, makes it quite clear that the generally revived activity of cholera in April throughout the provinces was an ordinary occurrence, which was only affected by the pilgrim movements to the extent of increasing the mortality from cholera mainly at the expense of the pilgrims themselves. Had the pilgrims delayed their departure from Hardwar after cholera had commenced to be active there, there is no doubt that the disease would have made terrible havoc amongst them at that place. As it happened, however, the pilgrims had left Hardwar before cholera attained its period of maximum intensity there, and they thus escaped exposure to its effects at that place; but, nevertheless, large numbers of them, in their dispersion towards their homes, especially the large bodies travelling by road, came under the influence of the disease in different parts of the country over which it was generally diffused, and in large numbers fell victims to it; and perhaps the sum total of the deaths from cholera among these returning pilgrims was quite as great as it would have been had they remained at Hardwar during the period of the maximum activity of the disease there.

With regard to the prevalence of cholera in the Punjab during the months immediately preceding the assemblage at Hardwar, the mortuary returns show that in this province, as in the North-Western Provinces and Oudh, the disease was either completely quiescent or else manifested its presence only by a few scattered deaths during the first three months of the year, but that in April it broke out into activity in all the districts up to the Indus, except in the usually exempt areas of the Multan division, and did not prevail in the country beyond the Indus until the following month. The disease attained its period of maximum intensity during the months from May to August in the different districts, and the mortality bears no relation to the movements of the pilgrims dispersing in April and May from Hardwar. The districts lying nearest to Hardwar, one would expect, on the supposition of the transportation and dissemination of the disease by pilgrims, should show the earliest and most marked signs of the activity of the disease. But there is no evidence of this having been the case furnished by the mortuary returns. Indeed the districts towards the north-west show a much smaller mortality in April than do those towards the south-west of Hardwar; and the same difference is observed in the returns for May, in which month the disease attained its period of maximum intensity in the south-west districts, whereas in the districts towards the north-west this period was not attained till June or July, and in some districts not till August. Comparing the death returns for 1879 with those for 1867, which was also a year of epidemic cholera coincident with a *Kumbh Mela* at Hardwar, the disease is shown to have pursued a very similar course in the two years, so far, at least, as is represented by the registered mortality, although the epidemic of the earlier year was nearly twice as fatal as that of the later one. In both years cholera was at a minimum or very low degree of prevalence during the first three months of the calendar. In April it broke into activity generally all

over the country up to the Indus, and with a mortality markedly corresponding in point of period of maximum intensity in many of the districts.

Regarding the meteorology of the year 1879 in the North-Western Provinces and Oudh, the principal element which is comparable with that of preceding years is the rainfall. In 1879 the rainfall was very unusually abundant and prolonged (see Table No. V.), the amount measured being 51.35 inches against 35.27 inches in the preceding year, and against 38.16 inches, the average fall for these provinces. This great fall was only exceeded by that of 1871 (when the amount measured was 54.69 inches), and nearly equalled by that of 1867 (in which year the amount was 50.87 inches), out of the whole series of years for which we have the statistics, viz., from 1864 to 1881 inclusive. This heavy rainfall, as has been before noted, followed upon a period of six months of drought, more or less uninterrupted and severe. During this period (see Table No. II.) the cholera epidemic of 1878, which culminated in August of that year, rapidly abated, and sank to a minimum of prevalence, or ordinary quiescence, during the first two months of 1879, but began to show signs of a revived activity in March of this year. During the months of April, May, and June—the second quarter of 1879—the amount of rainfall was 6.50 inches, a quantity insufficient to saturate the parched soil, but quite enough to produce rapid evaporation of moisture from its surface, under the action of the sun approaching the summer solstice, and to cause sudden and extreme variations in the daily ranges of temperature and humidity of the lower strata of the atmosphere. With these conditions of the weather there occurred a very severe and sudden outburst of epidemic cholera activity in April, which quickly culminated in May, and during June continued at much the same degree of intensity, the decline in the mortality being very trivial. In the next three months—the third quarter of 1879—the amount of rainfall was 40.93 inches, an altogether exceptionally high figure for this period, and in our whole series of years is only approached by the rainfall in the same quarter of 1871, in which year also the behaviour of cholera in relation to the rainfall corresponded with that of the year now under consideration. By this heavy rainfall during the months of July, August, and September 1879 the ground rapidly became saturated with moisture and the air surcharged with humidity, and evaporation from the soil, with its attendant variations of temperature and moisture in the atmosphere, received a check from the activity prevailing in the preceding quarter. With these conditions of weather the cholera, which was at the height of its epidemic intensity in May and June, suddenly commenced to abate in July by a very marked diminution of mortality, and this abatement was progressively continued during the next two months. In October the abatement was not so continuous, the mortality remaining at much the same figure as in the preceding month, and this was coincident with the termination of the heavy monsoon rains; but in the next two months, with the setting in of the cold weather and the subsidence of the rainfall to 3.12 inches in the last quarter, the cholera rapidly ceased its epidemic activity, and at the end of the year sank to a minimum of prevalence.

In the case of the year 1871, above referred to, it will be seen that cholera, as in this year, commenced epidemic activity in March, but made comparatively little progress during the next five months, in which the rainfall was abundant, and sufficient to saturate the soil and air with moisture, as it was not preceded by a period of drought, as was the case with the rainfall of the corresponding quarters of 1879. On the termination of the monsoon rains, however, and the sudden decline of the rainfall from 39.62 inches in the third

quarter to only 1.34 inch in the fourth, the saturated soil commenced to give off its moisture by evaporation into a dry atmosphere under a yet hot sun; and with these conditions of weather cholera suddenly burst into epidemic activity in September, and rapidly advancing, culminated in November, after which, with the setting in of the cold weather, the epidemic rapidly abated, and sank to a minimum of prevalence in February 1872. These instances, among many others of similar kind, afford strong evidence in support of the views I have before enunciated regarding the fixed relation that subsists between the prevalence of epidemic cholera and the effects of rainfall upon the soil—a relation which is affected also, in respect to the aggravation or mitigation of the epidemic severity, by the general health standard of the people as it is influenced by the prices of food. In 1871 prices of food were unusually cheap, and the cholera epidemic of the year was of a mild character, except towards the close of the year, when prices had considerably risen. In 1879, on the other hand, the prices of food were very high, and in many parts approached famine rates, and the cholera of the year was nearly twice as severe as that of 1871.

1880.—In this year cholera, instead of subsiding to a minimum of epidemic prevalence, as was normally due in the periodic cyclical course of the disease in this the third year of the triennial cycle 1878–80, prevailed with greatly increased epidemic activity. The death-rate from the disease rose among the civil population to 1.67 per mille against 0.81 in the preceding year. The total number of deaths registered from cholera in the North-Western Provinces in 1880 was 31,557 against 30,621 in 1879, or at the rate per mille of population of 1.02 against 0.99, respectively; and in Oudh, 39,987 against 5271, or at the rate per mille of 3.34 against 0.44, respectively. This greatly increased prevalence of cholera in these provinces during 1880 was coincident with a very marked deficiency in the rainfall, which, coming after a year of excessively heavy rainfall, had the effects of a drought upon a previously rain-saturated soil. The rainfall of 1880 (see Table No. V.) was more than 22½ inches less than that of 1879, and it was also less than the average by about 9½ inches. The defect was most marked in the third quarter of the year; and the effect of this defect upon the course of the cholera of the year is shown in Table No. II., where, it will be seen, there was a revival of epidemic activity in the month of September. After two years of very high prices food became cheap in 1880, in consequence of the abundant rainfall and plentiful harvests of the preceding year; but there is little doubt that the general health standard of the people had not yet thoroughly recovered from the privations of the two preceding or even three preceding years.

Comparing the death returns for 1880 with those for 1879, the figures show that the cholera of 1880 prevailed with very greatly increased—not very far short of eightfold—severity in Oudh, and with but slightly increased severity in the North-Western Provinces, as above shown.

In Oudh the close of 1879 was marked by a general subsidence of the very mild epidemic cholera of that year in all the districts, and its entire cessation in all but four districts before or by the commencement of the last quarter of the year. The year 1880 opened with a continuation of the subsiding cholera of the preceding year in the Gonda district, and with its final cessation in that of Bahraich, these two districts only, of the twelve in Oudh, showing any deaths from cholera in January. In February the disease reappeared in the Sultanpur and Partabgarh districts after an absence of six and seven months respectively, and in Lucknow after an absence of five

months. In March cholera was epidemic in Bara Banki, Sultanpur, Partabgarh, Gonda, and Fyzabad; and in April in Lucknow, Sitapur, and Bahraich. In April the disease suddenly rose to its maximum fatality of the year in all the first five named districts. In Kheri, Sitapur, and Hardoi the maximum mortality was attained in August, and in Kheri a second maximum in October. In Lucknow and Bahraich also the maximum mortality was attained in August. At the close of the year cholera was present with considerable activity in all the districts, except Hardoi and Unao, in both of which the disease had ceased at the end of October; in Sultanpur, towards the close of the year, cholera showed a tendency to revived activity.

In the North-Western Provinces the cholera of 1880 showed no signs of activity in the districts of the Jhánsi division; but in those of the Benares division it prevailed with markedly increased fatality in all the districts, except Ghazipur and its subdivision, Ballia, in which the mortality was less, and in the Benares district, in which it was somewhat more than in the preceding year. In the Allahabad division the disease prevailed with markedly increased fatality in the Allahabad and Jaunpur districts, to which apparently the epidemic force displayed in Hamirpur and Banda in 1879 was transferred in this year. In the districts of the Agra and Meerut divisions the cholera of 1880 was in very marked abeyance everywhere. In the Rohilkhand districts, on the other hand, there was marked increase of cholera mortality in all the districts, except Budaun, in which the mortality was less; in Sháhjahánpur the disease prevailed in peculiarly severe epidemic form from July to October inclusive, and caused 5738 deaths against 326 in the previous year. In the districts of the Kumaun division the cholera of 1880 was represented by a total of only 29 deaths against 10,986 in the preceding year.

The returns show that the cholera of 1880 in these provinces, in the areas where it prevailed epidemically, commenced activity in the month of March, instead of in April as in the preceding year, except in the northern districts—Rohilkhand—where it commenced in July. During the year 1880 deaths from cholera were reported from 9575 centres of population, equivalent to 8.1 per cent. of all the centres of population in the province. In the eighteen districts of epidemic prevalence cholera deaths were reported from 8623 centres of population, equivalent to 14.5 per cent. of the total number of centres of population those districts contain.

The year 1880 was a year of scanty rainfall generally in the united provinces. In only 8 of the 49 districts was the fall greater than the average; these were Kumaun and Garhwál in the Himalayas, Saharanpur, Muzaffarnagar, Meerut, and Bijnor on the plains neighbouring those mountains, and the Ballia subdivision of Ghazipur adjoining Bengal. In almost all the great plain of the provinces, including Rohilkhand, Oudh, Jhánsi, a great portion of the Doab, and a considerable portion of the Benares division, there was a serious failure in amount of the usual rainfall.

1881.—The cholera of this year, the first of the triennial cycle 1881–83, was a cholera of very weak intensity for its year, and greatly less prevalent than the cholera of the year before. The death-rate from the disease among the civil population was 0.60 per mille against 1.67 in 1880. The total number of cholera deaths registered in the North-Western Provinces during 1881 was 16,840 against 31,557 in 1880, or at the rate per mille of population of 0.55 against 1.02 respectively; and in Oudh 9024 against 39,987, or at the rate per mille of 0.75 against 3.34 respectively. This marked decline in the prevalence of the cholera of 1881 in these provinces was coincident with a rainfall but little below the average, though it was nearly 8½ inches

less than that of the preceding year. The price of food was still cheap, although higher than in 1880. The distribution of the rainfall (see Table No. V.) was such that there was no period of drought, except in the last quarter of the year. These conditions appear to have checked and repressed the revived epidemic activity of cholera normally due in this year.

As in the preceding year so in this the principal prevalence of cholera as an epidemic was confined to the Oudh districts and to those of the Allahabad and Benares divisions, but in greatly reduced intensity—in the Oudh districts especially, as is shown by the death-rates above given. The Jhánsi division, as in the preceding year, enjoyed almost complete immunity; but this was not the case with the Kumaun division, where cholera broke out in May, and ran a sharp and short epidemic course, which terminated with the entire cessation of the disease in July. In Rohilkhand the epidemic of the preceding year was not repeated in this, and the districts remained singularly free of any but the most trivial prevalence of the disease, except in Budaun, where a very mild epidemic ran its course from June to October. In the Meerut division cholera was more prevalent in this than in the preceding year, but in the Agra division it was the reverse. Of all the forty-nine districts in these provinces cholera was persistently active throughout 1881 only in those of Benares and Lucknow; but it was almost as equally persistent, whilst very much more actively prevalent, in the districts of Gorakhpur, Basti, and Azamgarh in the Benares division, and in Bara Banki, Fyzabad, and Sultanpur of the Oudh districts.

In its seasonal prevalence in these provinces the cholera of 1881, whilst manifesting the tendency observed in previous years to a double epidemic prevalence during the course of the year, presents some notable points of difference from the seasonal course pursued by the cholera of the preceding year; although, owing to the limitation of the disease as an epidemic to much the same areas as were epidemically affected during 1880, there is again observable a striking similarity in the seasonal course of the cholera of 1881 in the two great divisions of these provinces, viz., Oudh and the North-Western Provinces—a similarity which is even more identically the same in both during this than in the preceding year. In its seasonal course, then, in these provinces as a whole, as well as in Oudh and the North-Western Provinces separately, the cholera of 1881 commenced activity as early as February from the minimum to which the cholera of the preceding year had fallen in January. For the provinces together (see Table No. II.) the minimum prevalence to which the cholera of the preceding year had fallen is represented by 46 deaths registered in January, and the commencement of the cholera of 1881 by 96 deaths registered in February. With this slow and gradual commencement in February, the disease started into activity in March, with 924 deaths in that month, and advancing with greatly increased force, rapidly attained the climax of the year in April, with 7935 deaths in that month. The intensity now acquired was maintained through May, but with a slightly declining tendency, the deaths in that month amounting to 7462. In June this decline became more decided, and a steady abatement of epidemic activity set in; and this was steadily and progressively continued through the succeeding months to October, the mortality falling from 4184 deaths in June to 340 in October. The downward course of the disease was now checked, and cholera reviving into fresh activity in November, raised the mortality to 687 deaths in that month. This revived activity, however, was not maintained, and in December the disease again rapidly abated, the year closing with 327 deaths in that month against 96 in February and 46 in January. At the end of the year cholera was active in only a few districts

of Oudh and of the Benares division. In the districts of the Allahabad division and in the country to the north and west the disease had absolutely disappeared in October.

Summary Review.—From the preceding account, and the statistical tables at the commencement of this section, we find that cholera was generally prevalent over the whole of these provinces in 1862; but, so far as can be gathered from the incidence of the disease among the troops and jail populations, it was a cholera of subsided epidemic activity, as was normally due in this the third year of the triennial cycle 1860–62. In the following year we find, from the distribution of the disease amongst the troops and jails, that cholera was generally prevalent in these provinces, except in the Rohilkhand division; and it appears, from the death-rate among these classes, to have prevailed with a freshly revived epidemic activity greatly in excess of that of the cholera of 1862; and this was in the normal course of the periodic epidemic revival of the disease for this the first year of the triennial cycle 1863–65. During 1864 cholera, though widely diffused, was in abating prevalence; and during 1865, though still widely diffused, it was only partially epidemic, and had subsided to the minimum of epidemic prevalence in the cycle. The death-rates among the troops and jails—the only statistics available for these years—show the regular cyclical epidemic course of the disease through the succeeding years. Thus, from the minimum death-rate in 1862 (for the year 1861 is known to have been one of severer epidemic cholera in these provinces), the revived epidemic cholera of 1863—the first year of the triennial cycle—gave a death-rate of 8.92; in the second year of the cycle the rate abated to 3.53, and in the third year still further to 2.71. The statistics of rainfall are not complete for this triennial cycle; but the difference of the rainfall, as to amount and seasonal distribution, in the two years 1864 and 1865, coupled with the high prices of food in the latter year, account, under the views enunciated in these pages regarding the influence of rainfall upon cholera prevalence, for the unusually severe epidemic activity of the disease in 1865—the third year of the cycle; for it will be seen by reference to Table No. V. that the rainfall of 1865, though greatly above that of 1864, was still somewhat below the average, and insufficient to saturate the soil and air with moisture, owing to the drought and aridity of the preceding year, and hence gave rise to rapid evaporation from a parched soil, with its concomitant changes of temperature and humidity in the lower strata of the atmosphere.

In the next triennial cycle, 1866–68, we find that the regular cyclic course of epidemic cholera is marked by a serious divergence from the normal order, and that the freshly revived epidemic activity of the disease is transferred from the first to the second year of the cycle. This irregularity was caused by, or at least was coincident with, a very remarkable equality of the seasonal distribution of the hot-weather monsoon rains of 1865 and 1866, and to but slight difference in the amount of rainfall in the two years; whilst the prices of food remained, also, the same during the two years. The consequence of this equality of rainfall and similar distribution as to season in the two years was an equable temperature and moisture during the several seasons of the year, and the absence of those causes which disturb these conditions; so that the freshly revived epidemic cholera of the year found no favourable conditions for the development of its activity, and prevailed only at a very low degree of severity for this year of the cycle, and as compared to the cholera of the preceding year, subsided to a minimum of prevalence. In 1867 the epidemic activity of cholera, which was checked so markedly in

the preceding year, fully developed itself, and the death-rate among the troops and jails rose to 5.22 against 0.81 in 1866. This great and irregular epidemic activity of cholera in 1867 was caused by a very abundant rainfall following upon a season of deficient rainfall ending in a period of drought at the close of 1866, notwithstanding that in respect to food there was an improvement in prices. The rainfall of 1867, notwithstanding its abundance, was apparently insufficient to thoroughly saturate a parched soil and dry air. In 1868—the last year of the cycle—cholera returned to its normal periodic course, and subsided to a minimum of epidemic activity, represented by a death-rate of 0.51 against 5.22 in the preceding year. This marked abatement of the disease, besides being in the normal periodic course, was coincident with a very deficient rainfall following on a year of unusually abundant rainfall, but its seasonal distribution in relation to that of the preceding year was such that there was no period of drought between them, nor indeed till the close of 1868, whilst the very abundant rainfall of 1867 seems to have sufficiently stocked the soil with moisture to prevent the very scanty fall of 1868 falling upon a parched soil. The price of food in 1868 differed but little from that of 1867.

In the next triennial cycle, 1869–71, we have cholera statistics for both the troops and jails, and for the general civil population. They both coincide in showing the regular cyclic procession of the freshly revived periodical epidemic activity of the cholera of the cycle. Thus in the first year of the cycle the death-rate among the troops and jails and among the civil population respectively was 7.24 and 2.28, in the second year 0.93 and 0.70, and in the third year 0.57 and 0.48; or revival, abatement, and subsidence in the successive years. The fresh cyclic revival of epidemic cholera in the first year, or 1869, and its severity, was coincident with a rainfall somewhat below the average, but 11½ inches above that of the preceding year, and with a period of severe famine. The seasonal distribution of the rainfall of the year was peculiar, and the course of the cholera of the year in relation thereto is very instructive, and, by reference to Table No. II., will be found in conformity with the views I have before expressed concerning the dependence of cholera activity upon the effects of rainfall upon the soil. For instance, the rainfall of the first quarter of 1869 was 2.35 inches, and this followed upon a rainfall of 0.17 inch in the preceding, or last, quarter of 1868; the cholera deaths registered in October, November, and December 1868 were 828, 361, and 251 respectively, and in January, February, and March 1869 they were 441, 358, and 1681 respectively; in other words, the rainfall of the last three months following the drought of the first three months was accompanied by an increase of cholera activity, and this, too, at a period of the year when cholera, as a rule, is in abeyance, or in minimum prevalence. In the second quarter of 1869 the rainfall was 1.56 inch against 5.44 inches, the average fall in this season of the year, and against 2.35 inches, the full average fall, in the preceding quarter; that is to say, in the second quarter drought followed the comparatively abundant fall of the preceding quarter. With this very scanty fall the commencing activity of the periodically recurring epidemic cholera found favourable conditions for its development, and the disease steadily advanced in epidemic intensity. The deaths in April, May, and June were 4452, 6923, and 12,630 respectively. In the third quarter of 1869 the rainfall was 2½ inches less than the average fall for this period of the year, and this deficient fall, following upon the much greater deficiency in the preceding quarter, instead of saturating the soil, found all the conditions present for a rapid evaporation from its parched surface.

Under these favourable conditions of weather for its development cholera flourished apace, and acquired the maximum intensity of the year. The deaths were 14,383, 22,837, and 7594 respectively in July, August, and September—the last-named month being that in which the autumnal minimum prevalence of cholera usually falls. In the fourth and last quarter of 1869 the rainfall was 5.97 inches, that is, nearly 4½ inches above the average fall in this period of the year; and it fell whilst the heat of the sun in the first two months of the quarter was still considerable, and also in succession to a less than average rainfall in the preceding quarter; that is to say, the conditions were favourable to free and rapid evaporation of moisture from a thirsty soil. With these conditions present the naturally abating periodic cholera epidemic of the year still maintained much activity, the deaths in October, November, and December being 5384, 1241, and 397 respectively.

In 1870, the second year of this triennial cycle, cholera abated very considerably from the periodic epidemic activity of the preceding year; and this great abatement was coincident with a very marked improvement in the prices of food, the average rate for the staple food-grain—wheat—being 15.62 sers the rupee against 11.91 sers the rupee in the preceding year. It was also coincident with a very plentiful rainfall, the seasonal distribution of which was such as to leave no period of drought, or, at least, of very marked drought. The rainfall of 1870 was 49.68 inches; that is, nearly 11½ inches above the average annual fall, and nearly 13¼ inches above the fall in the preceding year. In the first quarter the fall was 1.74 inch against 2.13 inches, the average for this period; and this very slight defect came in succession to a fall of 5.97 inches against 1.57 inch, the average for that period in the preceding quarter, thus leaving no condition of absolute drought, but distinctly one of relative drought. With this condition we find that the subsiding epidemic cholera of the preceding year, which had sunk to its minimum mortality of 230 deaths in January 1870, was revived with considerable energy in February, the deaths rising to 527 in that month, and to 1263 in March. In the second quarter the rainfall was 8.45 inches, or 3 inches above the average for this portion of the year; and this excess of rainfall came in succession to a fall in the preceding quarter but little below the average; so that there was no thirst or drought of the soil, but rather a tendency to saturation, more especially in the latter part of the quarter. With these conditions we find the advancing cholera epidemic, which had started into activity in the preceding quarter, and was progressively increasing in the first two months of this quarter, suddenly arrested and on the decline in its third month, the mortality being 4216 deaths in April, 7641 in May, and 3473 in June, when the soil had become saturated by the more than usual rainfall at this period of the year. In the third quarter (Table No. V.) the rainfall was 37.12 inches, or more than 8 inches above the average fall for this portion of the year; and it came in succession to an excess of 3 inches above the average fall in the preceding quarter, thus completing the saturation of the soil and air with moisture, and more or less entirely preventing free evaporation, or, at least, very greatly impeding it. With these conditions of the rainfall and soil we find the progress of the cholera epidemic of the year, which, as we have seen, was checked in the last month of the preceding quarter, still further arrested, notwithstanding the natural tendency of the disease to prevail with increasing activity at this season of the year. The deaths were 1361 in July, 1725 in August, and 1861 in September. In the fourth quarter the rainfall was 2.37 inches, or fully three-quarters of an inch in excess of the average fall in this period of the year; so that, although

there was no absolute drought, there was, in comparison with the excessive fall in the preceding quarter, a condition of considerable relative drought, with dryness of the air, and yet high temperature, during, at least, the first two months of the quarter, under which the evaporation of moisture from the previously saturated soil had a more free play than was possible under the conditions obtaining in the preceding quarter. With these peculiarities of the rainfall and soil and air conditions, favouring rapid evaporation of moisture from the soil and its resulting changes of temperature and humidity in the air of the lower strata of the atmosphere, we find that the progress of the epidemic cholera of the year, which, as we have seen, was arrested under the influence of the opposite conditions obtaining in the preceding quarter was again resumed, and that the disease prevailed with a renewal of epidemic activity, which continued to the setting in of the cold season. The mortality in October rose to 2506 deaths, in November to 2600, and in December, the epidemic abating, fell to 1038; and finally the epidemic sank to the minimum of its prevalence, or to its final subsidence, in February 1871, with 215 deaths in that month.

In 1871, the third and last year of this cycle, the periodic cholera epidemic ran its cyclic course, and subsided to the minimum of epidemic prevalence in the cycle. This mild prevalence of the disease—of the epidemic cholera of 1871—was coincident with an unusual abundance and cheap prices of food, the average price of wheat being 23.56 sers the rupee against 15.62 sers the rupee in the preceding year, and with a rainfall which was still more abundant than the greatly more than average fall of that same year. The rainfall of 1871 was 54.69 inches, that is, 16½ inches more than the average annual fall, and 5 inches more than the very heavy fall of the preceding year. Its seasonal distribution, moreover, was such as to leave no period of drought, except in the last quarter of the year, in which, as will be presently seen, cholera prevailed with marked epidemic activity. In the first quarter the rainfall was 1.56 inch, or about half an inch less than the average fall in this period of the year; and it followed a fall of 2.37 inches in the preceding quarter, the last of 1870, which was more than three-quarters of an inch in excess of the average fall in that period of the year. With this amount of defect in the cold-weather rains of the first quarter as the weather characteristic of this portion of the year 1871, we find that the abating cholera of the close of the preceding year, suddenly ceasing activity, subsided into abeyance or lingered at a minimum of prevalence. The 1038 deaths registered in December 1870 were followed in January 1871 by only 291, and in February by 215; but in March the number rose to 265, thus giving the first sign of the commencing epidemic cholera of the year. In the second quarter the rainfall was 12.17 inches, or more than 6¾ inches in excess of the average fall in this portion of the year, and it came in succession to a fall deficient by half an inch of the average in the preceding quarter. Under this excessive rainfall in the second quarter, upon a soil hardly affected as to drought by the slight defect in the rainfall of the preceding quarter, both air and soil became more than usually charged with moisture; and under these conditions evaporation of moisture from the surface of the soil was more or less impeded, or, at least, was not so free as is usual at this season of the year under opposite conditions of the soil and rainfall. With these conditions of an unusually damp soil and air, we find that the commencing epidemic cholera of the year made but slow progress in the development of its activity, and that its first attempt in this direction was speedily suppressed. The mortality, which in April rose to 745 deaths, in

May stood at 727, and in June fell to 526; and with the increasing rainfall of the next month this abatement became more marked. In the third quarter the rainfall was 39.62 inches, or more than 10½ inches in excess of the average fall in this quarter of the year; and it followed an excessive fall, by 6¾ inches of the average, in the preceding quarter; so that both soil and air were surcharged with moisture, and more especially during the earlier half of the quarter. Under these conditions the suppressed activity of cholera, above noted, was maintained during the first half of the quarter, but with the diminishing rainfall and a still powerful sun, broke out into epidemic activity in its latter half. The mortality in July sank to 434 deaths, in August the number rose to 569, and in September to 1031. In the fourth quarter the rainfall was 1.34 inch, or hardly a quarter of an inch less than the average fall in this portion of the year; but, relatively to the excessive fall in the quarter preceding, it was a very defective fall, and produced a condition of relative drought, under which evaporation from a saturated soil became free and unusually active, especially during the first half of the quarter, when the sun was still powerful. With these conditions obtaining, the renewed activity of cholera, which marked the latter half of the preceding quarter gained increased force, and the disease very quickly attained the maximum epidemic development of the year, the mortality being 3964 deaths in October, 6704 in November, and, the disease abating with the setting in of the cold weather, 4034 in December.

Thus we see that throughout the course of the cholera epidemic of the triennial cycle 1869–71 the epidemic cholera of each successive year of the cycle has prevailed, as to times and seasons, in a fixed and constant relation to the rainfall, as it affects the soil to the production or prevention, as the case may be, of evaporation of moisture from its surface, together with the changes and variations of atmospheric temperature and humidity in the lower strata of the air arising therefrom; and, as to severity of epidemic prevalence, in a fixed and constant relation to the food-supply, as it affects the general health standard of the population at large.

In the next triennial cycle, 1872–74, the periodical cyclic cholera epidemic pursued a similar regular course of revival, abatement, and subsidence, in the successive years of its cycle, to that observed in the preceding triennial cycle. In the first year, 1872, the death-rate from cholera was among the troops and jails 4.79, and among the civil population 1.83; in the second year, 1873, it was 1.45 and 0.46 respectively; and in the third year, 1874, respectively 0.55 and 0.15. Let us now trace the course of the disease in connection with the food-supply and rainfall through the successive years of the cycle, as has been done in the case of the preceding triennial cycle, referring always to Tables Nos. II. and V.

In the first year, 1872, we find cholera freshly revived into epidemic activity and prevailing with maximum intensity in the cycle. With this maximum severity of the disease in the first year of the cyclic cholera epidemic, we find the food-supply scanty and prices very high, the average price of wheat being 17.14 sers the rupee against 23.56 sers the rupee in the preceding year, and the rainfall very abundant, the amount measured being 13¾ inches above the average, and its seasonal distribution irregular. The rainfall of 1872 was 41.92 inches, or 12¾ inches less than that of the preceding year. In the first quarter the fall was 3.20 inches, or fully 1 inch more than the average fall in this portion of the year, and it followed a fall in the preceding quarter, the last of 1871, which was very little less than the average fall for that quarter of the year. With these conditions of the rain-

fall, the epidemic cholera of the preceding autumn, which commenced to abate in December, rapidly subsided, and the new cholera epidemic of the cycle burst into activity with considerable initial violence. The mortality in January was 377 deaths, in February 178—representing the termination of the preceding year's epidemic—and in March 3492—representing the commencement of the cholera epidemic of this cycle. Here we see that during the cold-weather months, January and February, in which evaporation was at a minimum, cholera sank into abeyance; whilst in March, with the sun past the vernal equinox, and the soil moistened by a more than usual amount of rainfall, evaporation became active, and cholera commenced its periodical epidemic course with much initial energy. In the second quarter the rainfall was 5.81 inches, or but very little above the average fall for this season—about a quarter of an inch—and under the action of a hot sun gave free play to very active evaporation, especially in the early half of the quarter, in which the rainfall was lighter than in its later half. With such conditions obtaining the freshly started epidemic cholera increased suddenly and greatly, and then, with the greater rainfall and commencing saturation of the soil and air with moisture, began to abate. The mortality was represented by 18,477 deaths in April, 16,970 in May, and 10,748 in June. In the third quarter the rainfall was 34.80 inches, or $3\frac{3}{4}$ inches above the average, and, coupled with the vapour clouds of the hot-weather monsoon season, sufficed to more or less considerably saturate the soil and air with moisture, and thus check any very free or great amount of evaporation, though, of course, there were intervals of more active evaporation corresponding with intermissions of the rainfall; and with such conditions we find the epidemic activity of cholera steadily kept in check, though with fluctuations in the severity of its prevalence. The deaths were 4486 in July, 8038 in August, and 6507 in September. In the fourth quarter the rainfall was 0.11 inch, or nearly $1\frac{1}{2}$ inch less than the average; and this defect came in succession to a by no means very excessive rainfall in the preceding quarter, so that it would be attended by free evaporation only in the earlier part of the quarter, whilst the sun was still hot. With these conditions the restrained cholera of the preceding quarter steadily and quickly subsided, and the epidemic of the year finally terminated in January 1873. The deaths were 5986 in October, 1518 in November, and 354 in December.

In the second year, 1873, cholera prevailed with greatly abated force from that of the preceding year, notwithstanding that food was still scarce and prices ruled somewhat higher, the price of wheat being 15.22 sers the rupee against 17.14 sers the rupee in the preceding year. The rainfall of the year was less than that of the preceding, and also less than the average annual fall; it was, moreover, peculiarly abnormal in its seasonal distribution; circumstances which, under the views I have enunciated regarding the relation of cholera prevalence to rainfall in its effects upon the soil, account for the very great and marked abatement in the epidemic activity of the disease from that which obtained in the preceding year. The rainfall of 1873 was 35.18 inches, or $6\frac{3}{4}$ inches less than that of 1872, and 3 inches less than the average annual fall. In the first quarter the fall was 1.26 inch, or more than four-fifths of an inch less than the average in this season of the year, and it followed a period of almost complete drought in the preceding quarter, the last of 1872, in which the rainfall was only 0.11 inch; so that during these six months the soil and air received very little moisture by rainfall, and evaporation was at a minimum of activity. Under these circumstances the epidemic cholera of the preceding year finally terminated, or

sank to minimum prevalence, in January 1873; and the new epidemic, or epidemic revival, of this year commenced with very weak force, and advanced with slow and mild increase of activity. The mortality in January was 242 deaths, in February 345, and in March 605. In the second quarter the rainfall was 1.97 inches, or 3½ inches less than the average; and this great defect came upon a soil already parched by a period of six months' drought, so that the little rain which fell would be speedily evaporated from the parched soil under the action of the summer sun; the small amount of rainfall would necessarily limit the extent of evaporation, and so we find with the limited amount of evaporation a limited amount of epidemic cholera prevalence, this prevalence being greater in the latter half of the quarter, in which the rainfall also was greater. The mortality was 1608 deaths in April, 1623 in May, and 3331 in June. In the third quarter the rainfall was 31.79 inches, or 2¾ inches more than the average for this portion of the year; and it fell upon a more or less thirsty soil, only partially moistened by the showers that fell during the latter part of the preceding quarter. The first downpour of the monsoon rains in July, however, accompanied by the rush of vapour clouds and reduction of temperature, produced a temporary excess of saturation and check to free evaporation; but all this soon wore away with the progressive dissipation of monsoon rains, and evaporation again had play under the lighter showers succeeding upon the first heavy downpours. Under these circumstances the mildly progressing epidemic cholera of the year received a check in July, but again recovered activity during the next two months. The deaths were 2508 in July, 3546 in August, and 3534 in September. In the fourth quarter the rainfall was 0.16 inch, or about 1⅓ inch less than the average, and this great defect, during the first half of the period, in which the sun was still powerful, gave a free scope to evaporation from the soil moistened by the monsoon rains of the preceding quarter; but these having been already mostly dissipated from a parched soil, the moisture left was not such as to produce much or prolonged evaporation. Under these circumstances the epidemic cholera of the year rapidly abated, and finally subsided into quiescence in February 1874. The mortality was 1191 deaths in October, 480 in September, and 196 in December.

In the third year, 1874, the cholera epidemic of the cycle terminated its periodic course, and subsided to a minimum of epidemic prevalence. The food-supply of the year was somewhat less scanty than in the preceding year, and rates cheaper; but they were still very high, the price of wheat being 17.26 sers the rupee against 15.22 sers the rupee in the preceding year. The rainfall of the year was very abundant, and the excess fell entirely in the second and third quarters, an irregular distribution which, under the views already explained regarding the relation of cholera prevalence to rainfall, accounts for the very mild prevalence of the disease in this year. The rainfall of 1874 was 48.53 inches, or 10⅓ inches more than the average annual fall, and 13⅓ inches more than the fall in the preceding year. In the first quarter the fall was 1.53 inch, or somewhat over half an inch below the average fall in this portion of the year, and it came in succession to a period of nearly complete drought in the preceding quarter, the last of 1873, in which the rainfall was only 0.16 inch. This defect constituted a period of six months' drought, more or less complete, during which evaporation of moisture from the soil was in abeyance, or at a minimum; and with these conditions obtaining, we find cholera quiescent, or at a minimum of prevalence. The epidemic of the preceding year finally ceased with 36 deaths in January and 28 in February; and the epidemic of this year commenced

with only 47 deaths in March. In the second quarter the rainfall was 10.05 inches, or 4½ inches more than the average, that is, nearly double the average fall in this portion of the year. This heavy rainfall, although coming in succession to a period of six months of drought, was sufficient to rapidly saturate the soil and air with moisture to a greater or less extent, and thus to prevent very free or active evaporation, especially under the reduction of temperature caused by these heavy rains at the outset of the summer season. Under these conditions cholera remained inactive, or prevailed at a minimum of frequency, and with no sign of general epidemic development. The deaths were 101, 197, and 238 in April, May, and June respectively. In the third quarter the rainfall was 36.35 inches, or 7⅓ inches in excess of the average, and, following upon the excessively heavy fall in the preceding quarter, served to keep up the state of more or less general saturation of the soil and air with moisture, except in a few exceptional localities where circumscribed epidemic outbreaks took place. Under these conditions cholera in general epidemic form made no progress, although the total mortality was increased during the latter half of the quarter, when the monsoon rains became lighter towards their final termination. The deaths were 134 in July, 389 in August, and 1559 in September. In the fourth quarter the rainfall was 0.60 inch, or nearly 1 inch less than the average, and with this defect following upon the excessive falls in the two preceding quarters, there was free scope for active evaporation from a soil well saturated with moisture, especially under the action of a still hot sun in the first half of the quarter. Under these circumstances we find that the cholera, which had broken out into some activity towards the latter part of the preceding quarter, acquired increased force in the early part of this quarter, and then, with the advent of the cold weather, rapidly abated, and finally subsided to minimum prevalence in January 1875. The deaths were 2911 in October, 743 in November, and 81 in December. Thus we see that in the successive years of this triennial cycle, as in those of the preceding, the prevalence of cholera, in respect to the increase or decrease of its activity, has uniformly borne a direct relation to the rainfall, as this affects the soil in respect to the evaporation of moisture from its surface, and the changes thereby produced in the temperature and humidity of the lower strata of the atmosphere.

In the next triennial cycle, 1875–77, the periodical cholera epidemic again appeared, and pursued a regular course of revived epidemic activity, abatement, and subsidence in the successive years of the cycle. In the first year, 1875, the death-rate among the troops and jails was 2.11, and among the civil population 1.54; in the second year, 1876, it was 0.54 and 1.13 respectively; and in the third, 1877, it was 0.78 and 0.74 respectively. Let us now, as in the two preceding cycles, trace the course of the cholera of the successive years in connection with the food-supply and the rainfall, referring, as before, to Tables Nos. II. and V.

In the first year, 1875, the freshly revived cyclic cholera epidemic, appearing at the due time of its periodical recurrence, ran its course of epidemic activity with very markedly less severity than usual in the first year of the cyclic career of the disease. The death-rate in this first year of this cycle was, among the troops and jails, only 2.11 against 4.79 in the corresponding year, 1872, of the preceding cycle, and 7.24 in that, 1869, of the cycle before it. Among the civil population the death-rate in the corresponding years was 1.54, 1.83, and 2.28 respectively. The lesser severity of the commencing cyclic cholera epidemic in 1875 was coincident with unusual abundance and cheap rates of food. In the other two years the greater

severity of the disease was coincident with scarcity of food and famine respectively, and with proportionately high prices. The average price of the staple food-grain—wheat—was, in sers per rupee, 22.58 in 1875, 17.14 in 1872, and 11.91 in 1869; thus showing that an epidemic of cholera prevailing under independent circumstances is very seriously affected, as to the mitigation or aggravation of its severity, by the general health standard of the population, as this is influenced by the nature of the food-supply in respect to dearness or cheapness.

With reference to the rainfall of 1875 and its relation to the seasonal prevalence of the cholera of this year, we find the same chain of sequences as has been described in tracing the progressive course of the disease through the successive years of the two preceding cycles. Thus the rainfall of 1875 was 39.44 inches, or only 1¼ inch above the average annual fall; but it was 7 inches less than that of the preceding year, and its seasonal distribution was such as to produce intervals of more or less pronounced drought, favouring free play of evaporation from the surface of the soil on the occurrence of succeeding showers of rain. In the first quarter the rainfall was 1.80 inch against 2.13 inches, the average fall in this portion of the year, or a deficiency of one-third of an inch, and this following a still greater deficiency in the preceding quarter, the last of 1874, in which the rainfall was only 0.60 inch against 1.57 inch, the average fall for this portion of the year, or a defect of nearly 1 inch; so that for these six months the soil was subjected to a prolonged period of drought until the latter part of the first half of the first quarter of 1875, when the spring showers began to fall. Under these circumstances the subsiding epidemic cholera of the preceding year finally ceased with 35 deaths in January, and the new cyclic cholera epidemic commenced activity with 216 in February, and the number increased by 1923 in March. Here, it will be observed, the commencing activity of the epidemic cholera of the year was coincident with the first rainfalls upon a thirsty soil under the effects of increasing temperature, with the sun past the vernal equinox. In the second quarter the rainfall was 4.21 inches against 5.44 inches, the average fall in this portion of the year, or about 1¼ inch in defect, and this following a deficient fall in the preceding quarter; so that the rains of the second quarter, falling upon a thirsty soil under the influence of an increasingly powerful sun, gave rise to very free and active evaporation from a dry soil barely moistened by the light rainfall, and more especially so at the earlier part of the period, and until the thirst of the soil was somewhat quenched by succeeding showers. Under these conditions the epidemic activity of cholera acquired a suddenly increased development in the earlier part of the quarter, and then abated with the declining activity of evaporation as the air and soil became more saturated by moisture from the later rainfalls of the period. The mortality was 14,757 deaths in April, 9816 in May, and 7557 in June. In the third quarter the rainfall was 33.17 inches against 29.01, the average fall in this portion of the year, or about 4⅛ inches in excess. This excessive fall, heaviest in the early part of the period with the first burst of the monsoon rains, rapidly saturated both soil and air with moisture, and thus impeded free evaporation from the surface of the soil until the later part of the period, when, the monsoon slackening, evaporation again came into free play. With these circumstances of soil and rainfall, cholera still further abated during the early part of the period, but resumed epidemic activity in the later part of it. The deaths were 5305 in July, 6396 in August, and 10,051 in September. In the last quarter the rainfall was only 0.25 inch against 1.57 inch, the average fall in this por-

tion of the year, or about 1⅓ inch in defect. This deficiency following upon an early termination of the monsoon rains, which by their excess left the soil in an unusually moist state under the influence of a still powerful sun, gave free play to a very active evaporation of moisture from the surface of the damp soil; and this evaporation, though gradually becoming less, was, owing to the unusual dryness of the season and higher than normal temperature, prolonged further than usual into the cold weather. With these conditions obtaining, the revived activity of cholera, which marked the latter part of the preceding quarter, abated with less than the usual rapidity observed at this season of the year. The mortality was 5263 deaths in October, 1717 in November, and 1391 in December. With the establishment of the cold weather, however, the epidemic very suddenly subsided, and finally ceased with only 65 deaths in January 1876.

In the second year, 1876, there was a decided abatement in the epidemic severity of the cholera of the year as compared with that of the first year of the cycle; and this mild prevalence of the disease in 1876 was coincident with very unusual cheapness of food, the average price of wheat being 26.30 sers the rupee against 22.58 sers the rupee in the preceding year. Yet the abatement, on the whole, was not so marked in this second year of this cycle as it was in the corresponding year of the two preceding triennial cycles; this was owing to the deficient amount and irregular seasonal distribution of the rainfall of the year, which offered conditions favourable to the activity of cholera, notwithstanding the effects of cheap food in enabling the people to resist the assaults of the disease. In the first quarter the rainfall was 0.48 inch, or about 1⅔ inch less than the average, and this in succession to a defect of 1⅓ inch in the preceding quarter, the last of 1875; so that there was a period of six months of more or less uninterrupted drought, except as regards the first quarter of 1876, towards its latter part, when a few light showers fell. With these conditions of the soil and weather the subsiding epidemic cholera of the preceding year finally terminated with 65 deaths in January, and the epidemic cholera of 1876 commenced activity with 198 deaths in February and 556 in March. In the second quarter the rainfall was only 2.06 inches, or 3⅓ inches less than the average, and this in succession to the defective falls in the two preceding quarters; so that the scanty showers, falling upon a parched and thirsty soil, were quickly evaporated, and caused rapid and great alternations in the temperature and humidity of the lower strata of the air. With these conditions existing the activity of the commencing epidemic cholera acquired a very marked increase of force, especially in the later part of the quarter, when the light showers were more frequent. The deaths were 2348 in April, 8757 in May, and 16,500 in June. In the third quarter the rainfall was 26.99 inches, or 2 inches less than the average; and 12.23 inches of the amount fell in the month of July alone, in succession to 1.35 inch in June, out of the total 2.06 inches of the second quarter. This heavy rainfall, coupled with the vapour clouds of the incoming monsoon, served to saturate the long-parched soil and dry air with moisture, and thus checked the free evaporation of moisture from the soil which characterised the preceding quarter, and, moreover, the check thus established was kept up during the rest of this quarter by falls of 7.16 and 7.60 inches in August and September respectively. Under these circumstances the increasing activity of the epidemic cholera, which in June attained a height represented by 16,500 deaths, was suddenly checked, and the abatement thus produced continued through the rest of the quarter. The deaths were 8651 in July, 4217 in August, and 4629 in September. In the fourth quarter the rainfall was 1.94 inch, or a little

more than one-third of an inch in excess of the average, and it all fell in the month of October (November and December being rainless), when the sun was still hot and the soil still damp from the monsoon rains; in the early part of the quarter consequently evaporation of moisture from the soil was free and active; and with these conditions the subsiding epidemic cholera still showed some activity in the early part of the quarter. The deaths were 1798 in October, 631 in November, and 61 in December, the epidemic of this year finally ceasing with 18 deaths in January 1877.

In the third year, 1877, the last of the cycle, the periodic cholera epidemic terminated its cyclic course in a mild epidemic prevalence, with the minimum of activity in the cycle. This minimum prevalence of cholera in 1877 was coincident with a very great rise in the prices of food, in many parts amounting to famine rates; the average price of wheat was only 16.20 sers the rupee against 26.30 sers the rupee in the preceding year. This instance of mild epidemic cholera prevalence under the pressure of generally high prices of food well illustrates, what has often been noticed and recorded by many observers, that the distress caused by famine and high prices, whatever other diseases it may produce, does not produce cholera, although it usually more or less seriously aggravates the mortality caused by an epidemic cholera produced by and prevailing under conditions entirely distinct from those of famine distress. Similarly, it has often been noticed and recorded by many observers, that there is a real and fixed relation between cholera prevalence and rainfall, but they have never explained what that relation is. It is the object of this work to supply that deficiency, and to explain how the real and fixed relation, so constantly observed in all parts of the country, between cholera prevalence and rainfall is a true relation of cause and effect. This has been done from time to time repeatedly in previous passages of this history, and the subject is now here again mentioned because the course of this year's cholera affords striking evidence in proof of the correctness of the views I have so often enunciated in these pages. The mildness of the epidemic cholera of 1877, notwithstanding the disturbing element of scarcity of food, was due to the scanty rainfall, and to its peculiar seasonal distribution, which was such that there was no period of drought in the cold months followed by heavy rainfall in the hot months. The rainfall of 1877 was only 23.18 inches, or about 15 inches less than the average annual fall, and about 8¼ inches less than that of the preceding year, and its seasonal distribution was altogether exceptionally irregular. In the first quarter the fall was 4.55 inches, or nearly 2½ inches in excess of the average; this rainfall, although heaviest in the first two months of the quarter, followed upon two rainless months in the preceding quarter. With the heavy rainfall, 2.13 inches, in January, the soil was more than usual at this season saturated with moisture; and this, coupled with the weak power of the winter sun, kept evaporation from its surface in unusual check; the cholera deaths in this month were only 18, the lowest number recorded in January in the whole series of years for which we have the statistics, viz., from 1867 to 1881 inclusive. With the lighter rainfall, 1.59 inch, in February, and the advance of temperature, evaporation of moisture from the surface of the soil made its first beginnings, and the epidemic cholera of the year gave its first signs of commencement; the deaths in February were 63. With the still lighter rainfall, 0.83 inch, in March, and the increasing heat with the sun past the vernal equinox, evaporation of moisture from the soil became more active, and the commencing epidemic cholera acquired greatly increased prevalence; the deaths in March were 3865. In the second quarter the rainfall was 3.46

inches, or nearly 2 inches less than the average, and it followed upon an excessive fall, by 2½ inches above the average, in the preceding quarter; and this, with a growingly hot sun, gave free play to evaporation to the limited extent of moisture in the soil, until the latter part of the period, when a heavier rainfall, coupled with the vapour clouds of the advancing monsoon, somewhat checked it. With this successively free and checked evaporation of moisture from the soil, the epidemic cholera of the year successively advanced and receded; thus in April and May, with light rainfalls of 0.52 and 0.80 inches respectively, the deaths were 8698 and 7004, whilst in June, with the heavier rainfall of 2.14 inches, the deaths were 3480. In the third quarter the rainfall was only 8.98 inches, or 20 inches less than the average; it was hardly enough to moisten the soil at this season of the year, and under a midsummer sun was soon evaporated; but the soil was left parched, and evaporation of moisture from its surface was reduced within very narrow limits, especially towards the latter part of the quarter, when the rainfall was lightest. With the limited evaporation of moisture from the soil in the first two months of the quarter cholera proportionately flourished; with its diminution in the third quarter the disease declined; thus in July the rainfall was 4.10 inches, and the cholera deaths were 3522; in August the corresponding figures were 3.16 and 2363, and in September 1.72 and 972 respectively. In the fourth quarter the rainfall was 6.19 inches, or nearly 4⅔ inches in excess of the average. Of this amount 3.82 inches fell in October, whilst the sun was still hot, and followed upon a much lighter fall in the preceding month; it was soon dissipated, and gave rise to a more active evaporation of moisture from the soil; and with this revived activity of evaporation cholera increased in prevalence; the deaths in October were 1120. In November the rainfall was only 0.05 inch, and, with the declining power of the sun, evaporation was limited to the moisture left by the unusually heavy fall in the preceding month; the deaths in November were 449. In December the rainfall was 2.32 inches, and mostly remained in the soil, evaporation at this season of the year being naturally at a minimum; the deaths in this month were 216, and the epidemic cholera of the year finally ceased with 35 deaths in January 1878. Thus we see that in this third triennial cycle, as in the two preceding, the periodically recurring cyclic cholera epidemic has pursued its course of epidemic activity through the successive years of the cycle in uniform relation, as regards its seasonal rise and fall, to the rainfall, as this affects the soil in respect to its condition of aridity or humidity; whilst at the same time it has preserved the regularity of its progressive course through the successive years of the cycle, viz., maximum of intensity in the first year, abated activity in the second, and minimum of prevalence in the third.

In the next triennial cycle, 1878–80, the periodically recurring cyclic cholera epidemic again appeared, and commenced its career in due course with a maximum of epidemic intensity in the first year of the cycle, and with the usual abatement, as to time, in the second; but in the third year the epidemic, diverging from the normal course, prevailed with unwonted severity. In the first year the cholera death-rate among the troops and jails was 3.49, and among the civil population 0.80; in the second it was 0.63 and 0.81 respectively, and in the third 2.64 and 1.67 respectively. The cause of this irregular epidemic activity of cholera in the last year of the cycle was the deficiency of the rainfall and its seasonal distribution after a year of excessively abundant rainfall. We now proceed to trace the course of the cholera epidemic of 1878–80 through the successive years of its cyclic

career, and, as in the case of the three preceding cycles, the relation of each year's epidemic cholera to the food-supply and the rainfall.

In the first year, 1878, the death-rate from the epidemic cholera of the year, taking the troops and jails and civil population together, is represented by 2.14 per mille. This maximum intensity of the cholera epidemic of this cycle in its first year was coincident with great scarcity and very high prices of food; the average price of wheat was 14.04 sers the rupee against 16.20 sers the rupee in the preceding year. The rainfall of the year was considerably more than that of the preceding; but it was less than the average, and its seasonal distribution was such as to produce intervals of more or less severe relative drought, followed by copious rainfall, thus giving free play to active evaporation of moisture from the surface of the soil. The rainfall of 1878 was 35.27 inches, or $2\frac{9}{10}$ inches less than the average, and 12 inches more than that of the preceding year. In the first quarter the fall was 2.69 inches, or nearly half an inch above the average, and it came in succession to an excessively heavy fall, by nearly $4\frac{2}{3}$ inches, in the preceding quarter, the last of 1877, and 1.92 inch of the amount fell in January alone. With this heavy fall in the early part of the quarter the subsiding epidemic cholera of the preceding year finally ceased, and with the lighter falls in the next two months the fresh epidemic of this year commenced slowly and gradually to develop activity. The deaths were 35 in January, 85 in February, and 133 in March. In the second quarter the rainfall was 4.61 inches, or about four-fifths of an inch less than the average, and it fell in progressively increasing quantity in the succeeding months of the quarter, viz., 1.03, 1.70, and 1.88 respectively. The deaths were 837, 862, and 2877 respectively. With the great excess of rainfall in the two preceding quarters the soil was saturated with damp, and the very slight deficiency in this quarter hardly affected evaporation from the soil until its latter part, when the power of the sun became greater; and then the heavier fall following the lighter falls in the two preceding months served to afford moisture for a freer evaporation. Under these conditions cholera, as above shown, acquired a very marked increase of activity. In the third quarter the rainfall was 27.77 inches, or $1\frac{1}{4}$ inch less than the average, and it followed a defect in the preceding quarter also. Under the deficient rainfall of this and the preceding quarter, coupled with the increasing heat of the sun, the abundant rainfall of the two preceding quarters had disappeared from the soil; so that the heavier rains of the monsoon in this quarter did not suffice to saturate the thirsty soil, but only served to furnish moisture for a more free evaporation. The rainfall in each of the three months of this quarter was 9.37, 11.61, and 6.79 inches respectively, and the cholera deaths were 2585, 4159, and 3333 respectively; the deaths in the second month increased in correspondence with the heavier rainfall, that is, freer evaporation in that month. In the fourth quarter the rainfall was 0.20 inch, or $1\frac{9}{10}$ inch less than the average, and it was evenly distributed between the three months; this great defect followed a considerable defect in the preceding quarter, and with a still hot sun in the first half of the period, favoured the evaporation of moisture from the soil. With this condition cholera flourished, and proportionately with the evaporation, being greater in prevalence in the early half, when the sun still retained considerable power, and less in the latter half, when winter had set in. The deaths were 3952 in October, 2398 in November, and 975 in December; the epidemic of the year, then abating towards its close, finally terminated with 35 deaths in February 1879.

In the second year, 1879, the continuation of the cholera epidemic of the

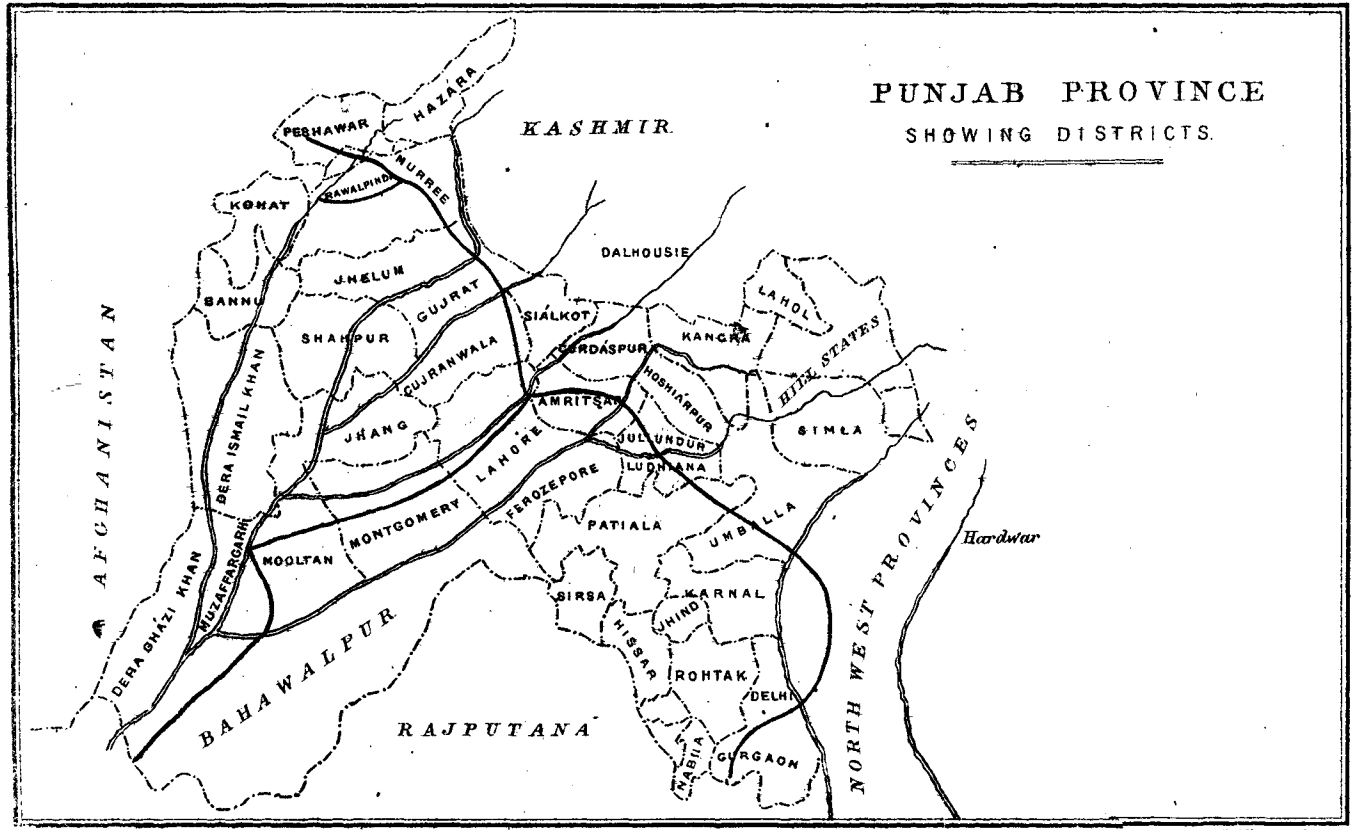
cycle was, in the normal course, of less epidemic prevalence than in the first year; the death-rate for the year, taking the incidence of the disease among the troops and jails and the civil population together, was 0.72. This abatement of the disease took place during the continuance of much scarcity of food and very high prices, the average price of wheat being 14.20 sers the rupee, or much the same rate as prevailed in the preceding year, and was due, in the face of these unfavourable conditions, to the amount and the seasonal distribution of the rainfall of the year, which was, respectively, excessive and very irregularly distributed over the several quarters. The rainfall of 1879 was 51.35 inches, or $13\frac{1}{3}$ inches above the average, and about $16\frac{1}{10}$ inches in excess of that of the preceding year; and it was so distributed that the greater portion of the excess fell in the third quarter, so as to produce a saturation of the soil and air with moisture, thus checking the free play of evaporation and impeding the progress of the epidemic cholera of the year. In the first quarter the rainfall was 0.80 inch, or $1\frac{1}{3}$ inch less than the average, and it followed a defect of nearly 2 inches in the fall of the preceding quarter, the last of 1878, thus producing a period of six months of more or less severe and continuous drought, the light showers of the whole period being pretty evenly distributed over the six months. Under these circumstances, with the light showers in the cold weather of January and February, 0.10 and 0.42 inch respectively, evaporation of moisture from the surface of the soil was very limited; whilst in March, with the commencement of increasing temperature, the light showers of that month, 0.28 inch, afforded the means for a freer evaporation to commence. These conditions obtaining, the abating epidemic cholera of the preceding year finally subsided, and ceased with 64 deaths in January and 35 in February; and the epidemic cholera of this year commenced its course of activity with 259 in March. In the second quarter the rainfall was 6.50 inches, or somewhat more than 1 inch in excess of the average, and it came in succession to defective falls in the two preceding quarters, and at a time when the power of the sun was progressively on the increase. Of the total fall, 0.94 inch occurred in April, 0.24 in May, and 6.22 inches in June. Thus in the first two months the light showers falling upon a thirsty soil would be at once dissipated by evaporation; whilst in the third, the heavy fall, accompanied by the vapour clouds of the in-setting monsoon, would suffice to partially saturate the parched soil and dry air with moisture, and thus check the previous activity of evaporation. Under these circumstances the commencing epidemic cholera of the year acquired greatly increased prevalence in the first two months, and received a check in the third. The deaths were 4731 in April, 8062 in May, and 7969 in June. In the third quarter the rainfall was 40.93 inches, or $11\frac{9}{10}$ inches in excess of the average, and this in succession to an excess fall in the preceding quarter; the effect of this heavy fall was to increase the saturation of the soil and air with moisture, and thus keep free evaporation in check; the fall in July was 17.27 inches, in August 15.91, and in September 7.75; so that the saturation established by the heavy falls in the first two months was kept up by the lesser but still abundant fall in the third. Under these circumstances, the check received by the advancing epidemic cholera of the year, in consequence of the first heavy rainfall in the latter part of the preceding quarter, was not recovered, and the disease continued steadily abating in correspondence with the increasing saturation of the soil and air with moisture. The deaths were 5290 in July, 3947 in August, and 2431 in September. In the fourth quarter the rainfall was 3.12 inches, or $1\frac{1}{2}$ inch in excess of the average,

and it came in succession to excess in the two preceding quarters; moreover, the whole amount, except 0.31 inch in December, fell in the month of October; so that the saturation of the preceding months was maintained in the first half of this quarter, in which the sun was still powerful. With this condition obtaining the abatement of the epidemic cholera of the year was continuous, and the epidemic finally subsided with 30 deaths in January 1880, the mortality being 2420 in October, 654 in November, and 30 in December. Here, in the course of the epidemic cholera of 1879, we see the disease breaking out with considerable initial energy, and suddenly acquiring a high intensity of prevalence, which, under the unfavourable conditions of the food-supply, would have gone on increasing but for the peculiar character of the rainfall, which, by its effects on the soil and air, produced a state of affairs inimical to the free development of epidemic cholera activity, and thus restrained the disease within the moderate bounds normal to this year as the second of the triennial cycle.

In the third year—1880—the last of the triennial cycle, the cyclic cholera epidemic, instead of, as usual, subsiding to a minimum of epidemic prevalence in this the third year of its periodic cyclic course, prevailed with increased severity, quite unusual in this year of the triennial cycle. The death-rate for the year, taking the troops and jails and the civil population together, was 2.15. This great increase in the prevalence of the epidemic cholera of this year took place under, and despite of, very unusually favourable conditions in respect to the food-supply. In 1880 food was abundant and cheap, the average price of wheat being 21.93 sers the rupee against 14.20 sers the rupee in the preceding year; and it was due entirely to the character and seasonal distribution of the rainfall, the effects of which upon the soil produced conditions favourable to the development of epidemic cholera activity. The rainfall of this year was greatly in defect, in succession to a year of unusually abundant rainfall, and the defect occurred mostly in the third quarter, thus allowing of unusually free evaporation from an imperfectly saturated soil in that period. The rainfall of 1880 was only 28.68 inches, or 9½ inches less than the average, and 22⅔ inches less than that of the preceding year. In the first quarter the fall was 1.45 inch, or two-thirds of an inch less than the average, and it all fell in the first two months, in succession to an excess of 1½ inches in the preceding quarter, the last of 1879; so that the soil was well stored with moisture, proper to this season of the year, during the first two months, and though the third was rainless, under the increasing heat of the sun past the vernal equinox, was in a condition to give off active evaporation of moisture from its damp surface into the unusually dry air of this month. Under such circumstances the subsiding epidemic cholera of the preceding year finally ceased in January, and the epidemic cholera of this year commenced in February, at first very slowly, and then, in March, with considerable initial activity. The deaths in the respective months were 30, 50, and 1795. In the second quarter the rainfall was 4.23 inches, or 1⅕ inches in defect, and it followed a defect in the preceding quarter; the falls in the successive months were 0.07, 1.13, and 3.03 inches, and in the Oudh Province there was no rainfall at all in the first month. This peculiar distribution of the rainfall caused a severe drought in the early part of the quarter, especially in Oudh, and under the effects of increasing temperature with the sun advancing to the summer solstice, gave rise to very active evaporation from the extensive marshy tracts, river-banks, and damp soil in that province, and in both Oudh and the North-Western Provinces to a less extent during the rest of the quarter. Under these circumstances the commencing epidemic

cholera of the year acquired greatly increased activity, especially in Oudh, where the pressure of high prices of food also operated to aggravate the severity of the mortality, especially until the first showers of May somewhat quenched the thirsty soil in that province. The deaths were 21,046 in April (mostly in Oudh), 9945 in May, and 7706 in June. In the third quarter the rainfall was 21.81 inches, or $7\frac{1}{5}$ inches less than the average, the falls being 12.13 inches in July, 3.21 in August, and 6.47 in September; the cholera deaths were respectively 6335, 15,100, and 4262. It will be observed that with the lighter fall in August, and consequent freer evaporation, there was a very marked increase in the cholera mortality. In the fourth quarter the rainfall was 1.19 inches, or only four-tenths of an inch less than the average, and it was about evenly distributed through the several months; so that evaporation had play till the cold weather set in. The deaths were 2973 in October, 1733 in November, and 571 in December, and the epidemic of the year finally ceased with 46 deaths in January 1881.

Of the next triennial cycle, 1881–83, our statistics only include the first year, the death-rate for which indicates no great revival of epidemic cholera activity such as characterises the first year of the three preceding periodically recurring cyclic cholera epidemics; it holds rather the place of an abated epidemic, such as is usual in the second year of the cycle, and as if the epidemic of the preceding year was really the commencement of a new cyclic cholera epidemic appearing before its proper time. However, be this as it may, the course we have traced of cholera through the several years of the successive triennial cycles 1869–71, 1872–74, 1875–77, and 1878–80, in the relation of its prevalence to the conditions of the food-supply and the rainfall, as these affect the health standard of the people and the climatic changes of the country, is sufficient to show that cholera, whatever be the cause of its periodical recurrence and its three-year term of epidemic prevalence in progressively declining force, is steadily and uniformly affected as to its seasonal activity by the character of the rainfall, and as to its fatality by the character of the food-supply. And this is the case not only in these provinces, but in all the other provinces of British India also, the slight differences observable in some of them being easily accounted for by the peculiarities of climate and soil. Everywhere the same sequence of results is observable, viz., cholera prevalence accompanying evaporation of moisture from the soil, whether this evaporation arise from rainfall on a parched soil, or, as in Bengal and other areas, from a water-logged soil in seasons of drought or no rainfall, and cholera abeyance or abatement accompanying cessation or diminution of surface evaporation, whether this be caused by saturation of the soil and air by rainfall moisture or by the inundation of rivers, &c. The regular uniformity of these results, so clearly exhibited in a general way by the statistics relating to aggregate groups and extensive areas, is not so distinctly and uniformly traceable in smaller communities and particular localities, although in individual instances and places it very often is so. The fact is, that the effects of evaporation of moisture from a more or less damp soil are not always limited to the area of that evaporation itself, but may extend themselves very widely, to places in which there is appreciably no sign of any such process going on, either by favouring circumstances in the natural conformation and physical characters of the country or by the action of winds. And hence it is that we sometimes find epidemic cholera prevailing in areas on which there has been no rainfall, or but a minimum quantity, for months, and in areas, too, noted for their natural and general condition of aridity.



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SECTION X.

PUNJAB PROVINCE.

Geographical Position

THE province lies between 27° 39′ and 35° 2′ N. lat., and between 69° 35′ and 78° 35′ E. long., and is bounded on the north by Kashmir and hills of Swat, on the east by the Jumna River and the North-Western Provinces and Thibet, on the south by Rajputana, the Sutlej River, and Sindh, and on the west by the Suleman range, Balochistan, and Afghanistan. The divisions, districts, area, and population of the territory under British administration are shown in the annexed tabular statement. The Native States dependent on the Punjab, thirty-five in number, in 1876–77 had an estimated area of 114,739 square miles, with an estimated population of 5,410,389 persons, thus making the total area of the province 219,714 square miles, and its gross Native population 23,021,887.

STATEMENT *showing Population, Area, and Density of Population in each District of the Punjab Province for the Year* 1868.

Divisions.	Districts.	Population (Census 1868).			Total of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Delhi.	Delhi	326,306	282,544	608,850	1,916,423	1,258	5,592	496	369
	Gurgaon	370,251	326,395	696,646		1,938		348	
	Karnal	330,763	280,164	610,927		2,396		264	
Hissar.	Hissar	266,847	217,834	484,681	1,232,435	3,540	8,467	137	167
	Rohtak	292,389	244,570	536,959		1,811		295	
	Sirsa	117,052	93,743	210,795		3,116		68	
Umballa.	Umballa	550,577	458,283	1,008,860	1,625,699	2,570	3,963	394	904
	Ludhiana	319,342	263,903	583,245		1,375		429	
	Simla	22,119	11,475	33,594		18		1,888	
Jullundur.	Jullundur	429,187	353,833	783,020	2,465,668	1,322	11,891	596	378
	Hoshiarpur	504,393	434,497	938,890		2,180		450	
	Kangra	393,460	350,298	743,758		8,389		87	
Amritsar.	Amritsar	465,074	367,676	832,750	2,733,334	1,573	5,353	535	514
	Gurdaspur	501,247	404,879	906,126		1,822		496	
	Sialkot	538,705	455,753	994,458		1,958		510	

Continuation of Statement showing Population, Area, and Density of Population in each District of the Punjab Province for the Year 1868.

Divisions.	Districts.	Population (Census 1868).			Total of Divisions.	Area in square miles.		Population per square mile.	
		Males.	Females.	Total.		District.	Division.	District.	Division.
Lahore.	Lahore . . .	428,286	347,265	775,551	1,859,543	3,648	8,979	218	210
	Gujranwala . .	306,296	244,280	550,576		2,587		207	
	Ferozepore . .	293,595	239,821	533,416		2,744		204	
Rawal Pindi.	Rawal Pindi .	376,665	322,982	699,647	2,185,778	6,218	16,792	114	161
	Jhelum . . .	264,690	236,298	500,988		3,910		128	
	Gujrat . . .	331,919	284,428	616,347		1,973		324	
	Shahpur . . .	195,823	172,973	368,796		4,691		78	
Mooltan.	Mooltan . . .	252,734	207,031	459,765	1,462,776	5,880	20,292	80	76
	Jhang	193,624	154,403	348,027		5,702		61	
	Montgomery .	200,016	159,421	359,437		5,574		64	
	Muzaffargarh .	162,122	133,425	295,547		3,136		98	
Dera Ismail Khan.	Dera Ismail Khan	212,734	182,130	394,864	992,389	9,296	17,504	56	88
	Dera Ghazi Khan	171,273	138,705	309,978		4,377		118	
	Bannu. . . .	154,061	133,486	287,547		3,831		91	
Peshawur.	Peshawur . .	267,606	232,837	500,443	1,613,080	2,504	8,177	271	148
	Hazara . . .	191,423	175,795	367,218		2,835		122	
	Kohat. . . .	79,323	66,096	145,419		2,838		52	
Total of the province .		9,509,902	7,977,223	17,487,125		107,010		173	

Physical Aspects.

Extending from the River Jumna on the east to the foot of the Suleman range on the west, and from the Outer Himalayas on the north to the desert of Rajputana and Sind on the south, the province comprises five well-defined tracts, viz., the Punjab proper, or country of "five rivers"—the confluent streams of the Sutlej, the Beas, the Ravi, the Chenab, and the Jhelam; the Sind Ságar Doáb, or country between the Jhelam and the Indus; the Deraját, or trans-Indus territory, between the Indus and the foot of the Suleman range; the Sirhind tableland between the Sutlej and the Jumna—the cis-Sutlej districts; and the Himalayan valleys of Kangra, Kulu, Lahaul, and Spiti, and the valleys of the Hazara frontier towards the Hindu Kush. The general slope of the country is from the snow-clad mountains bounding it on the north and east by a slight south-westward declivity towards the arid sandy plateau of Rajputana and Sind on the south and south-west. All its rivers, except the Jumna, bounding it on the east, follow the general slope of the land, and, joining the Indus low down its course, empty into the Indian Ocean by the outlet of that river. The great alluvial plain of the Punjab depends for its physical features entirely upon the action of the rivers by which it is thus traversed. Naturally the plain belongs to the same wide and level tableland as the desert of Rajputana and Sind, and would, owing to the scanty precarious rainfall of Northern India, present a similar arid and barren surface as those southern tracts were it not for the fertilising influence of its great rivers. On the plain, after leaving the hills, the rivers flow "each in a constantly changing central channel, occupying the middle or one side of a broader valley, whose limits are marked by high banks of clay, which bound the level plateau above." The river valleys themselves are irrigated by inundation, by per-

colation, by wells, or by artificial canals; but the high intermediate plain stretches from stream to stream in a broad and undulating expanse of sterile sandhills and stunted vegetation, except where under canal or well irrigation. In these sterile tracts the well water is in many places from 50 to 120 or more feet below the surface, especially in the districts bordering on the Rajputana and Sind deserts on the south. Thus the populated and cultivated tracts lie along the course of the several rivers, while the sterile intermediate tracts are sparsely peopled and mainly used as pasture-lands. As a rule, wood is scarce throughout the Punjab, except upon the hills and about the towns and villages. In the cis-Sutlej districts there are extensive mango groves, and in the Derajat large areas are covered with date palms. On the sterile tracts between the rivers the surface is generally covered with jungle scrub, principally composed of mimosa and zizyphus and coarse grasses. The climate of the plain country is noted for its dryness and heat. At the foot of the hills the rainfall is comparatively high, but it diminishes towards the north-west of the province, and on the plain in proportion with the distance from the hills, the southern districts on the borders of the Rajputana and Sind deserts being almost rainless. (Hunter's *Imperial Gazetteer.*)

Cholera History: Statistical and Descriptive.

In the following series of tabular statements, Nos. I. to VI., are exhibited, in uniformity with the corresponding tables furnished with the history of cholera in the other provinces of British India, the statistics of cholera mortality among the troops and jail populations, and, so far as available, among the civil population also, together with the rainfall records and prices of the staple food-grain for the twenty years 1862 to 1881 inclusive:—

No. I.

STATEMENT *showing the Annual Total Deaths registered from Cholera among the Civil Population in each of the Districts of the Punjab Province for the Years from* 1865 *to* 1881 *inclusive.*

Districts.	Total Cholera Deaths registered in the Years																
	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Delhi	72	103	1,321	12	47	15	58	219	14	15	287	2	...	44	416	2	167
Gurgaon	36	15	3,148	31	636	85	24	162	80	4	526	13	2	163	753	2	5
Karnal	*92*	*67*	*1,652*	*31*	*39*	*16*	*16*	1,089	6	2	72	1	...	...	1,606	1	125
Hissar	17	6	3,265	4	301	5	4	74	2	1	142	...	...	...	3,674	2	...
Rohtak	14	9	1,066	3	46	9	7	3	1	1	239	17	1	...	2,020	3	1
Sirsa	107	14	1,077	6	72	7	3	99	3	2	26	1	1	...	1,088	2	1
Umballa	149	80	2,617	32	48	27	35	1,121	6	14	349	7	1	1	609	6	212
Ludhiana	29	54	1,538	17	19	12	12	717	2	3	83	2	1	...	255	3	21
Simla	...	1	283	1	2	2	...	5	...	2	158	...	...	...	108	1	...
Jullundur	31	27	739	12	9	8	6	409	1	2	63	...	1	...	87	...	865
Hoshiarpur	112	76	875	19	27	12	9	724	4	2	236	...	...	...	82	1	331
Kangra	182	84	1,802	114	78	63	23	174	2	2	710	3	2	1	2,048	2	37
Amritsar	327	95	3,561	74	3,608	24	17	94	...	...	1,269	30	2	...	868	3	707
Gurdaspur	70	103	269	14	155	26	24	863	3	5	1,482	14	6	1	20	6	332
Sialkot	78	64	664	13	31	9	7	283	4	5	294	463	1	2	42	1	313
Lahore	65	57	2,095	13	297	38	36	629	14	9	288	722	5	1	1,673	14	1,643
Gujranwala	55	39	1,624	24	89	14	9	352	...	1	9	272	2	2	430	1	261
Ferozepore	1,728	...	2,185	12	20	5	1	322	2	...	1	...	...	...	1,947	2	23
Rawul Pindi	5	41	2,722	2	13	5	2	148	...	1	1	626	1	...	2,914	31	90
Jhelum	9	33	857	13	7	3	15	281	1	1	1	301	2	...	1,962	7	20
Gujrat	24	12	433	35	61	43	28	68	1	2	2	572	...	...	380	7	35
Shahpur	3	15	621	6	1	6	5	43	...	...	...	504	...	...	178	1	1
Mooltan	17	6	616	...	2	...	...	2	...	...	1	32	...	...	2	...	...
Jhang	...	2	103	...	1	1	4	1	...	...	...	3	...	...	242	...	...
Montgomery	...	...	498	3	16	...	1	5	...	...	2	1	...	...	101	...	5
Muzaffargarh	...	4	1,144	11	...	...	...	3	...	...	...	...	...	...	1	1	...
Dera Ismail Khan	34	1	232	...	2	7	2	22	...	...	2	240	...	...	38	...	...
Dera Ghazi Khan	4	...	857	1	2	1	1	1	1	2	1	5	...	...	1	...	...
Bannu	...	4	632	4	124	4	1	3	...	...	...	998	1	...	165	3	...
Peshawur	24	13	1,909	17	2,985	14	4	392	1	1	2	638	...	...	1,002	167	3
Hazara	11	15	1,565	8	12	8	14	68	...	1	...	245	...	...	781	5	3
Kohat	15	11	1,176	...	508	...	1	351	...	...	...	24	...	...	642	...	6
Totals	3,310	1,051	43,146	532	9,258	469	369	8,727	148	78	6,246	5,736	29	215	26,135	274	5,207

No. II.

STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in the Districts of the Punjab Province for the Twenty Years from* 1862 *to* 1881.

Years.	Cholera Deaths registered in the Months of												Totals.			Ratio per Mille of Population.	Average Rainfall in Inches and Cents.
	January.	February.	March.	April.	May	June.	July.	August.	September.	October.	November.	December.	Males.	Females.	Totals.		
1862	Cholera generally epidemic over most parts of the province.															...	32·37
1863	Cholera in abeyance everywhere in the province.															...	34·92
1864	Cholera active towards the close of the year in some districts.															...	24·98
1865	389	239	196	223	507	483	351	288	170	75	193	196	?	?	3,310	0·22	31·07
1866	69	36	49	114	106	116	108	88	84	47	116	118	?	?	1,051	0·06	24·35
1867	133	83	296	4,279	8,179	8,461	8,457	7,123	4,525	1,243	321	46	?	?	43,146	2·45	23·12
1868	49	26	30	43	63	60	44	39	42	90	26	20	361	171	532	0·03	20·65
1869	18	32	51	76	144	194	797	3,238	2,391	2,033	204	80	5,319	3,939	9,258	0·53	27·65
1870	29	31	16	33	53	87	52	43	48	22	24	31	303	166	469	0·03	20·14
1871	17	14	22	46	46	50	26	21	20	18	38	51	248	121	369	0·02	25·38
1872	12	22	18	98	1,073	978	489	2,859	2,424	660	92	2	5,228	3,499	8,727	0·50	31·19
1873	4	2	4	10	11	14	28	4	50	17	2	2	98	50	148	0·01	25·17
1874	1	1	3	12	9	10	6	11	16	3	4	2	45	33	78	0·004	26·12
1875	4	4	4	10	41	316	747	1,515	2,117	1,358	129	1	3,480	2,766	6,246	0·36	35·90
1876	4	7	2	6	8	236	1,096	1,396	1,421	1,277	280	3	3,362	2,374	5,736	0·33	28·51
1877	2	2	2	3	7	3	2	1	4	1	2	...	19	10	29	0·001	29·03
1878	1	4	...	...	...	2	32	70	70	8	27	1	134	81	215	0·01	31·24
1879	7	4	2	2,603	9,184	7,085	3,457	2,705	914	147	7	20	15,701	10,434	26,135	1·49	23·56
1880	1	3	6	9	7	15	8	33	14	120	55	3	201	73	274	0·01	22·53
1881	3	4	4	5	37	178	183	1,649	2,560	545	38	1	3,036	2,171	5,207	0·30	26·47
Totals	743	514	705	7,570	19,475	18,288	15,883	21,083	16,870	7,664	1,558	577	37,535	25,888	110,930	0·35	27·37

No. IIA.—STATEMENT *showing the Monthly Average Rainfall of the Punjab Province in Inches and Cents. for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	Rainfall in Inches and Cents. in the Months of												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	0·62	0·18	1·02	1·04	0·82	2·64	12·80	6·95	3·72	1·61	0·90	0·07	32·37
1863	2·24	0·24	1·19	0·49	0·33	4·74	14·22	7·55	1·06	1·90	0·15	0·81	34·92
1864	0·80	1·22	0·63	2·70	2·16	1·08	5·86	7·27	2·14	0·10	0·00	1·02	24·98
1865	1·49	3·55	3·04	1·14	0·69	0·77	3·75	8·92	5·24	0·03	0·17	2·28	31·07
1866	2·03	0·93	0·69	0·68	0·52	2·43	7·90	8·10	0·80	0·27	0·00	0·00	24·35
1867	0·44	0·65	0·94	1·55	2·06	0·97	5·57	8·78	1·49	0·13	0·01	0·53	23·12
1868	1·07	2·30	1·96	2·00	0·68	2·07	6·05	3·07	0·77	0·07	0·00	0·61	20·65
1869	1·41	0·46	5·24	0·22	0·04	1·60	8·20	3·29	6·35	0·63	0·00	0·21	27·65
1870	0·26	0·27	2·01	0·43	0·12	3·71	4·27	6·59	1·94	0·20	0·00	0·34	20·14
1871	0·24	2·99	0·12	0·35	0·92	6·10	8·41	3·99	1·27	0·02	0·00	0·97	25·38
1872	1·78	0·90	1·36	0·91	1·40	2·76	10·17	7·66	3·54	0·17	0·02	0·52	31·19
1873	0·81	0·27	0·76	0·07	2·05	0·38	9·26	6·56	3·59	0·63	0·03	0·77	25·17
1874	1·75	1·26	1·67	0·40	0·28	3·65	8·35	5·88	2·83	0·01	0·00	0·04	26·12
1875	0·24	2·14	0·37	0·04	1·23	1·20	8·26	10·52	10·15	0·78	0·32	0·65	35·90
1876	0·64	0·67	1·82	1·30	1·06	1·10	11·44	5·77	2·67	1·45	0·42	0·17	28·51
1877	2·91	3·28	1·36	2·37	1·62	2·24	2·71	1·06	3·30	1·38	2·41	4·39	29·03
1878	1·01	2·73	0·25	2·53	2·82	0·94	7·11	11·96	1·40	0·30	0·00	0·18	31·24
1879	0·05	0·24	2·16	0·06	0·18	4·38	5·16	8·68	1·82	0·05	0·00	0·78	23·56
1880	0·37	1·65	0·01	0·09	0·70	3·63	10·28	2·54	2·25	0·00	0·14	0·87	22·53
1881	0·12	1·21	2·48	1·54	0·73	3·16	8·52	7·09	1·40	0·14	0·00	0·08	26·47
Means	1·01	1·36	1·45	0·99	1·02	2·38	7·91	6·61	2·88	0·49	0·23	0·76	27·21

No. III.—STATEMENT *showing the Number of Admissions and Deaths from Cholera among the European and Native Troops and Jail Populations in the Punjab Province, together with the Average Strength and Rates of Admissions and Deaths per Mille of Strength for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.			Native Troops.			Jail Populations.			Grand Totals.			Ratio per Mille of Strength.	
	Strength.	Cholera.		Strength.	Cholera.		Strength.	Cholera.		Strength.	Cholera.		Admissions.	Deaths.
		Admissions.	Deaths.		Admissions.	Deaths.		Admissions.	Deaths.		Admissions.	Deaths.		
1862	17,100	363	203	22,056	174	87	10,345	240	93	49,501	777	383	15·69	7·73
1863	16,726	2	2	22,771	8	3	9,957	1	...	49,454	11	5	0·20	0·10
1864	16,850	1	1	20,399	1	1	9,630	1	1	46,879	3	3	0·06	0·06
1865	14,314	4	2	21,096	7	2	10,482	5	2	45,892	16	6	0·35	0·13
1866	13,565	1	...	21,430	...	...	10,697	...	...	45,692	1	...	0·02	...
1867	13,921	477	284	22,015	192	88	10,506	76	41	46,442	745	413	16·04	8·89
1868	12,877	...	...	21,869	2	...	11,056	...	...	45,802	2	...	0·04	...
1869	14,360	364	236	25,787	385	255	12,381	43	22	52,528	792	513	15·08	9·77
1870	10,921	1	...	25,987	...	...	12,785	...	...	49,693	1	...	0·02	...
1871	14,517	...	...	25,172	4	2	13,385	...	...	53,074	4	2	0·07	0·04
1872	16,428	326	224	26,240	173	105	13,512	91	41	56,180	590	370	10·50	6·57
1873	16,629	1	...	25,825	3	...	13,863	...	...	56,317	4	...	0·07	...
1874	15,011	1	1	25,877	1	1	14,619	...	...	55,507	2	2	0·04	0·04
1875	14,591	76	44	25,892	60	26	14,347	44	21	54,830	180	91	3·28	1·66
1876	16,369	109	81	25,553	102	57	13,479	30	14	55,401	241	152	4·35	2·74
1877	15,856	1	...	26,447	...	...	12,129	1	1	54,432	2	1	0·04	0·02
1878	14,657	1	1	26,860	...	...	15,230	9	6	56,747	10	7	0·18	0·12
1879	14,294	293	227	19,355	121	75	15,141	113	63	48,790	527	365	10·80	7·48
1880	13,562	57	44	21,295	23	18	14,324	1	1	49,181	81	63	1·65	1·28
1881	15,251	111	82	29,526	21	11	14,075	133	98	58,852	265	191	4·50	3·24

No. IV.—STATEMENT *showing the Percentage of Admissions from Cholera to Strength of the Affected Groups, and of Deaths to Admissions, among the European and Native Troops and Jail Populations, together with the Total Average Strength of each Class in the Punjab Province for the Twenty Years from* 1862 *to* 1881.

Years.	European Troops.				Native Troops.				Jail Populations.			
	Strength.		Percentage.		Strength.		Percentage.		Strength.		Percentage.	
	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.	Total Average.	Affected Groups.	Admissions to Affected Strength.	Deaths to Admissions.
1862	17,100	11,620	1·70	56	22,056	?	?	51	10,345	4,981	1·80	38
1863	16,726	3,335	0·06	100	22,771	?	?	37	9,957	355	0·28	...
1864	16,850	910	0·11	100	20,399	?	?	100	9,630	866	0·11	100
1865	14,314	1,573	0·25	50	21,096	?	?	28	10,482	972	0·51	40
1866	13,565	380	0·26	...	21,430	...	...	...	10,697	...	...	...
1867	13,921	8,524	5·50	59	22,015	11,949	0·88	46	10,506	2,285	33·70	54
1868	12,877	...	...	...	21,869	5,546	0·03	...	11,056	...	...	...
1869	14,360	5,804	6·20	65	25,787	10,396	3·70	66	12,381	1,598	2·60	51
1870	10,921	1,257	0·08	...	25,987	...	...	...	12,785	...	...	...
1871	14,517	...	...	...	25,172	4,824	0·94	...	13,385	...	...	...
1872	16,428	12,318	2·60	68	26,240	14,439	1·19	61	13,512	5,473	1·60	45
1873	16,629	1,433	0·07	...	25,825	3,984	0·07	...	13,863	...	...	...
1874	15,011	1,034	0·09	100	25,877	1,504	0·06	100	14,619	...	...	...
1875	14,591	6,176	1·23	58	25,892	3,276	1·83	43	14,347	2,864	1·54	50
1876	16,369	6,712	1·62	74	25,553	11,726	0·87	56	13,479	2,402	1·25	47
1877	15,856	1,719	0·05	...	26,447	...	...	...	12,129	1,962	0·05	100
1878	14,657	?	?	100	26,860	...	...	...	15,230	424	2·12	67
1879	14,924	11,729	2·51	77	19,355	16,203	0·75	62	15,141	5,985	1·89	56
1880	13,562	3,482	1·63	77	21,295	5,295	0·43	78	14,324	654	0·15	100
1881	15,251	4,656	2·38	74	29,526	7,642	0·27	52	14,075	3,107	4·28	74

No. V.—STATEMENT *showing the Yearly Prevalence of Cholera, as represented by the Death-rates registered among the Troops and Jail Populations, and among the Civil Population, of the Punjab Province for the Twenty Years from* 1862 *to* 1881 *inclusive, together with the Average Rainfall and the Average Price of the Staple Food-grain, Wheat.*

Years.	Cholera Death-rate per Mille of Strength or Population.					Average Rainfall in Inches and Cents.					Average Price of Staple Food-grain in Sers and Cents. per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Population.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	12·70	4·01	8·90	7·74	?	32·37	1·82	4·50	23·47	2·58	25·65
1863	0·12	0·13	...	0·10	?	34·92	3·67	5·56	22·83	2·86	29·24
1864	0·06	0·05	0·10	0·06	?	24·98	2·65	5·94	15·27	1·12	23·93
1865	0·14	0·09	0·19	0·13	0·22	31·07	8·07	2·61	17·91	2·48	18·98
1866	...	...	...	...	0·06	24·35	3·65	3·63	16·80	0·27	20·77
1867	20·86	8·07	3·90	8·89	2·45	23·12	2·04	4·57	15·84	0·67	19·39
1868	...	...	...	...	0·03	20·65	5·33	4·75	9·89	0·68	15·93
1869	16·86	9·80	1·78	9·77	0·53	27·65	7·12	1·85	17·83	0·85	11·32
1870	...	...	...	...	0·03	20·14	2·55	4·26	12·79	0·54	14·39
1871	...	0·08	...	0·04	0·02	25·38	3·35	7·37	13·67	0·99	19·20
1872	13·60	4·00	3·03	6·57	0·50	31·19	4·04	5·07	21·37	0·71	19·00
1873	...	...	...	...	0·01	25·17	1·84	2·50	19·41	1·42	21·48
1874	0·06	0·03	...	0·04	0·004	26·12	4·68	4·33	17·06	0·05	20·78
1875	3·01	1·00	1·47	1·66	0·36	35·90	2·75	2·46	28·94	1·75	24·96
1876	4·95	2·23	1·04	2·74	0·33	28·51	3·12	3·47	19·88	2·04	28·93
1877	...	...	0·08	0·02	0·001	29·03	7·56	6·24	7·07	8·16	27·31
1878	0·07	...	0·39	0·12	0·01	31·24	4·00	6·29	20·47	0·48	17·90
1879	15·88	3·87	4·16	7·48	1·49	23·56	2·45	4·61	15·66	0·84	12·46
1880	3·24	0·84	0·07	1·28	0·01	22·53	2·04	4·41	15·07	1·01	12·80
1881	5·38	0·37	6·96	3·24	0.30	26·47	3·81	5·43	17·01	0·22	14·76

No. VI.

STATEMENT *showing the Annual Rainfall at one and the same Station in each District of the Punjab Province for the Twenty Years from* 1862 *to* 1881.

Districts and Stations.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Delhi	50·40	36·80	27·70	29·70	35·80	23·00	8·10	23·50	24·20	32·20	32·70	34·20	22·30	38·20	18·90	17·90	38·10	35·95	27·05	26·30
Gurgaon	51·90	39·60	21·00	27·20	36·00	23·50	11·68	23·50	17·00	26·90	30·20	47·10	31·60	45·50	30·80	19·80	28·10	21·45	15·15	21·71
Karnal	32·30	50·50	20·00	30·80	19·10	28·20	10·80	23·60	28·80	33·30	37·50	41·00	40·90	38·40	20·00	27·00	26·60	23·20	31·60	22·50
Hissar	20·00	26·40	11·20	29·20	14·00	21·90	6·80	13·10	20·00	9·40	30·80	11·30	10·10	25·20	20·80	16·40	20·48	12·60	13·70	16·10
Rohtak	20·80	35·50	15·90	21·20	13·70	23·90	8·30	21·40	13·90	16·20	27·90	17·50	15·10	30·10	17·60	15·30	20·50	22·80	14·60	23·40
Sirsa	16·20	24·60	11·10	20·90	14·90	15·60	7·50	13·70	11·40	11·70	19·70	12·40	13·90	19·30	17·50	13·90	23·50	10·57	6·17	22·84
Umballa	35·80	57·80	28·20	48·70	36·70	38·30	19·80	28·30	35·10	38·50	51·00	43·70	40·60	33·80	28·50	23·70	39·00	23·90	40·30	26·00
Ludhiana . . .	19·30	45·60	23·90	25·90	24·60	19·60	16·00	39·30	19·30	18·20	46·20	25·80	17·70	36·18	15·63	39·26	37·63	21·65	41·35	32·93
Simla	97·70	69·00	94·90	79·30	66·80	52·10	61·30	58·00	69·20	73·90	71·92	66·15	56·49	91·39	79·33	61·23	59·38	71·03	88·52	57·44
Jullundur . . .	22·30	40·00	27·20	30·70	27·50	32·30	16·30	32·20	22·10	20·80	45·30	19·70	23·20	55·70	27·10	39·60	42·80	19·10	36·27	34·63
Hoshiarpur . .	51·30	34·70	31·60	39·20	35·80	30·80	25·70	32·60	32·90	30·50	43·50	24·00	37·00	44·60	34·30	47·80	48·10	23·20	38·50	44·56
Kangra (Dharmsala)	155·30	142·40	87·00	117·80	98·20	71·50	103·10	125·10	64·40	191·10	146·40	111·50	158·60	156·80	140·80	96·30	141·40	162·70	119·91	100·00
Amritsar . . .	20·70	41·30	19·80	29·90	22·80	25·20	17·20	21·60	11·60	16·30	28·30	21·30	16·20	43·00	30·50	32·50	32·90	18·80	21·70	62·40
Gurdaspur . . .	60·10	43·20	28·50	27·10	28·30	22·60	42·80	35·80	30·80	29·50	23·30	14·20	18·10	55·10	35·00	36·10	21·10	22·90	23·90	31·00
Sialkot	54·90	42·90	38·70	34·50	32·80	47·00	43·30	45·10	32·80	32·00	23·30	43·20	25·10	48·90	50·60	32·40	31·35	25·66	20·19	31·18
Lahore	20·20	26·40	12·40	24·00	17·20	20·10	15·10	19·90	9·20	8·70	17·10	25·30	15·20	33·20	21·50	20·23	20·88	19·18	11·27	26·38
Gujranwala . .	28·90	27·70	21·10	32·30	33·70	31·70	25·00	24·90	16·10	12·10	21·80	27·60	25·00	46·20	32·90	23·90	27·90	15·90	12·66	25·80
Ferozepore . . .	23·90	27·80	28·60	53·10	27·30	11·40	17·00	35·30	13·80	11·90	32·20	22·70	12·20	29·00	13·50	15·20	17·20	11·20	10·20	20·90
Rawal Pindi . .	36·50	37·70	38·90	28·80	24·10	21·30	23·40	27·80	30·00	28·50	30·30	28·70	41·10	48·80	37·63	40·09	38·03	33·82	20·33	27·10
Jhelum	24·40	30·40	35·50	47·40	30·50	16·60	18·10	18·20	19·80	13·30	17·80	14·10	19·70	28·30	20·20	36·20	26·30	29·40	14·50	17·10
Gujrat	38·60	52·50	36·10	39·60	29·50	30·60	31·30	30·70	21·10	25·90	31·80	21·90	24·70	31·30	42·30	30·70	30·10	24·30	12·40	25·90
Shahpur	24·60	16·40	11·60	19·40	10·90	12·90	6·90	4·50	10·00	12·30	25·10	16·40	14·60	11·00	16·00	15·40	29·30	10·60	10·70	14·60
Mooltan	7·92	13·76	6·29	5·64	2·50	6·40	5·10	13·50	2·00	1·90	5·50	7·00	9·70	7·43	15·48	13·60	10·30	4·89	5·07	4·27
Jhang	22·30	19·80	12·10	11·00	7·10	13·70	13·00	16·80	3·40	5·70	10·80	16·80	8·60	8·30	5·20	16·00	13·40	4·20	4·70	8·40
Montgomery . .	21·60	14.50	6·10	10·80	4·10	3·80	4·40	25·60	9.50	8·40	10·30	6·30	9·50	1·90	8·30	21·00	24·20	5·20	9·90	12·10
Muzaffargarh . .	5·99	7·70	6·30	6·00	1·40	5·00	2·80	9·40	5·50	5·30	7·60	5·80	6·70	5·30	8·70	11·60	10·10	3·20	1·20	4·40
Dera Ismail Khan	4·00	11·00	6·40	6·80	5·90	4·90	6·90	10·60	7·80	4·60	7·90	9·00	10·77	8·78	11·53	11·70	16·21	5·16	4·38	9·11
Dera Ghazi Khan	8·00	7·80	5·80	12·40	4·30	7·10	3·50	12·30	2·40	3·20	6·00	8·90	9·60	7·90	10·60	5·70	8·30	4·45	4·35	7·45
Bannu	10·30	24·10	13·00	12·50	12·40	15·20	18·00	9·70	6·10	8·70	6·50	9·40	19·40	16·20	12·20	18·70	15·50	14·60	11·30	10·90
Peshawur . . .	5·90	10·50	12·50	17·20	9·60	7·90	11·70	15·30	7·40	11·30	16·50	10·00	15·10	18·60	13·30	25·50	26·32	5·84	5·01	15·90
Hazara (Abbottabad)	35·10	42·90	51·00	53·00	35·30	47·00	44·20	45·80	32·30	49·70	69·00	30·40	39·80	55·90	52·30	69·30	48·30	35·70	32·90	48·50
Kohat	8·70	16·10	9·10	22·10	16·30	8·80	15·70	27·80	14·60	20·20	24·00	12·10	27·30	28·60	23·30	35·10	26·40	10·80	11·30	15·30

I now proceed to describe the history of cholera in the Punjab Province, as derived from the official reports for each year of the above series.

1862.—There are no statistics available to show the amount of prevalence of cholera among the civil population of this province until the year 1865; the records of the incidence of the disease among the troops and jails are our only guides to the seasonal prevalence and general diffusion of cholera in these three years. In 1862, however, the disease is known to have been generally diffused with more or less of epidemic activity, though very greatly less than that of the preceding year, over the whole province, excepting the usually exempt districts of the Mooltan division and the Lower Deraját, in the south-western portion of the province. Among the troops and jails together the cholera death-rate in this year was 7.74 per mille of strength; but the different classes suffered in very different proportions, the incidence of the disease being much heavier among the European troops and jail populations than among the Native troops. This is a fact worthy of attention, as it has been observed to obtain in all other years and in all the provinces of British India; as a rule, it is almost, if not quite, invariably found that the European troops and the jail populations (all, with a few rare exceptions, natives) suffer in approximately like proportion from cholera, when it is about in epidemic form, than the Native troops. In a subsequent part of this work I shall offer an explanation of the cause of this marked difference in the incidence of cholera among the European troops and jail populations on the one hand, and among the Native troops on the other. At present I proceed with the history of the disease in this province in 1862.

The incidence of cholera in 1862 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

Regarding the prevalence of the disease among the civil population, it is recorded that there were severe outbreaks of cholera in the Delhi, Rohtak, Karnal, Umballa, Lahore, and Peshawur districts, and that the disease "visited stations in which it had hitherto been rare or unknown;" and, as stated in the Dispensary Report for 1862, "this is the first time since Peshawur came under British rule" (in 1849) "that it has suffered from the disease." The report adds—"The occurrence of the scourge in 1862 at the same stations which had suffered so much from it in the year previous is also a new phase in the progress of this mysterious disease, which has hitherto been comparatively unknown and undreaded in these provinces, the only previous visitations having been in 1856, or ten years after the Punjab had been first occupied by European troops." Regarding the non-contagious character of cholera the report states—"The conviction, also, that it is not contagious has tended very much to reassure the Native population, and to satisfy them that it differs widely in this respect both from smallpox and mahamurree (or Indian plague)." The rains in this year, it is stated, "were remarkably heavy and prolonged." Regarding the districts affected by cholera in 1862 the following remarks are recorded:—

Amritsar.—"Another visitation of cholera has passed over the city, but prevailing generally in a more modified form in the villages of the district."

Montgomery, at that time called Gogaira.—"In the district in the months of May and June a considerable number of cases of cholera were reported; they occurred principally along the banks of the Sutlej, and a large proportion of them recovered under the use of medicines supplied from

the dispensary. . . . During the autumn nearly the whole population suffered from fever, and the mortality in the district was considerable."

Peshawur.—"In July cholera appeared in an epidemic form both in the station and district, and remained unchecked till September; 388 cases were treated in the dispensary, of which number 153 died. The Yusufzai division of the district almost entirely escaped from the disease, although it was raging in all the surrounding districts; nor did a single case occur on the left bank of the Kabul River, and yet hundreds of persons visited the city of Peshawur during the time cholera was most rife there, and returned without either contracting the disease themselves or communicating it to others."

Kangra.—In this district cholera appeared during the hot season. From the account of the cholera of 1862 given in Dr. Bryden's "Cholera in the Bengal Presidency from 1817 to 1872" (pp. 26, 27), it appears that the disease was rife among the pilgrims returning to their homes from the fair at Hardwar in 1862, and that cholera appeared in all the districts west of the Jumna, from Delhi northwards to Umballa, in the same month. In the Kangra district the disease appeared in April, and at the same time it was raging in Kashmir. Before the end of April cholera had appeared in the Bannu district, across the Indus, the whole of which, excepting its extreme northern portion adjoining the Rawal Pindi and Jhelam districts, remained exempt during the earlier months. At this time the Lahore, Amritsar, Gujranwala, and Sialkot districts were affected. The disease appeared in Peshawur in June, and continued prevalent for the four months following, and finally ceased in November.

The rainfall of the year 1862 was very abundant, being 5 inches above the average, and was unevenly distributed over the several quarters; the fall in the first quarter was greatly in defect, in the second it was equal to the average, but in the third and fourth, the former especially, it was greatly in excess of the average fall in those quarters of the year.

Regarding the food-supply, it is recorded that the "prices of grain continued at almost famine rates up to the close of 1861. The granaries of the Punjab were thoroughly exhausted, and the new harvest was closely stored and jealously husbanded." Prices varied greatly in different parts of the province, being cheapest at Delhi and dearest at Peshawur; in the latter the average price of wheat was only 12 sers the rupee against 29¼ sers the rupee in the preceding year.

1863.—In this year, the first of the triennial cycle 1863–65, there was apparently no revival of the periodic cyclic cholera epidemic in this province. The incidence of cholera in 1863 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

It would thus appear that the year 1863 was one of very mild epidemic cholera, or perhaps of cholera abeyance, in the Punjab Province; and that this was actually the case is very probable, inasmuch as the character and seasonal distribution of the rainfall, as well as the nature of the food-supply, were both highly unfavourable to the development of epidemic cholera activity. So that, although the cyclic cholera epidemic may have duly appeared in the normal course of its periodical recurrence, it could make no progress against the circumstances of weather and food-supply inimical to its free activity; and thus the disease, which was very widely diffused over the province (from Umballa to Peshawur, as shown by the recorded cases), and manifested its presence at different times between the months of January

and October inclusive, nowhere prevailed among the civil population in sufficient epidemic activity to attract attention or receive a record.

The rainfall of 1863 was very favourable both as to its amount and seasonal distribution (see Table No. V.), and corresponded closely with that of the preceding year, except that the rainfall in the first quarter was considerably greater. In both years the rainfall was considerably in excess of the average, viz., by 5 inches in 1862 and by 7⅝ inches in 1863, but in the latter year the seasonal distribution more closely approximated to the quarterly averages.

As regards the food-supply, there was a great improvement in prices in 1863, and in many districts rates were very cheap. At Peshawur the price of wheat was 25¾ sers the rupee against only 12 sers the rupee in the preceding year, and at Delhi it was 39½ sers the rupee against only 14½ sers the rupee in 1862.

1864.—In this year, so far as the returns for the troops and jails show, cholera was even less active than in the preceding year, and this is in the normal course for the second year of the cycle. See abstract in the tabular statements Nos. III. and IV. at the head of this section. Among the civil population there is no information regarding the cholera of 1864 beyond the fact that the disease was recorded in two circles of the Kangra district.

The year 1864 would thus seem to have been one of general cholera abeyance in the Punjab Province; but from the returns for the following year, 1865, in which, for the first time, the registration of deaths was commenced among the civil population of this province, it would appear that there was some considerable cholera activity in certain districts of the province towards the close of 1864, and that this epidemic activity passed on into the earlier months of 1865. The figures, in fact, show that the high cholera mortality with which the year 1865 opened in January had not subsided to the usual low figure of non-epidemic seasons in the month of March, before the normal recommencement of cholera activity in April. In the Ferozepore district particularly there seems to have been an active epidemic of cholera going on at the close of 1864, which subsided in the following March 1865, according to the usual course observed by cholera in this province, but immediately recommenced in April with the generally revived activity of the disease in that month. This is in accordance with the usual behaviour of cholera in this province. The disease then ran another epidemic course through the monsoon season of 1865, and again, according to the usual rule, subsided in October, but showed signs of a recommencing activity towards the close of 1865; this, however, does not appear to have been continued into the next year. The death returns of Kangra and Dera Ismail Khan for January 1865 also indicate the prevalence of some cholera activity in these districts during the close of 1864.

Probably, as indicated by the statistics of the incidence of the disease among the troops and jails, the cholera of 1864 was, on the whole, a cholera of very mild epidemic prevalence in this province, and also of less intensity than that of the preceding year, inasmuch as, notwithstanding a marked rise in the prices of food, the conditions of the food-supply and rainfall were not such as to favour any unusual development of epidemic cholera activity, although, with the light of subsequent experience, the character of the rainfall, in respect to its amount and seasonal distribution, was certainly such as was calculated to produce a greater prevalence of cholera activity in this year than is represented by the scanty statistics and incidental information available.

The rainfall of 1864 (see Table No. V.) was somewhat below the average, and about 10 inches less than that of the preceding year; so great a defect in this province—noted for the aridity of its soil and air—means more or less severe drought, and the inequality of the rainfalls in the second and third quarters indicate some activity of evaporation from the surface of the soil in the latter, thus producing climatic conditions favourable to the activity of cholera. On the other hand, the food-supply was abundant and cheap, and may be taken to indicate a fairly good state of the general health standard of the people, thus enabling them to resist the assaults of the disease, which itself prevailed in but weak intensity.

1865.—In this year, the third of the triennial cycle, cholera, instead of, in the normal course, still further abating in prevalence from that of the two preceding years, prevailed with greater activity.

From the monthly returns, it appears that the year 1865 opened with cholera actively epidemic in the Ferozepore district, and that throughout the year the disease was most fatally prevalent in that district of all the others, 1728 deaths, or more than one-third of the total mortality registered from cholera being returned from this one district. The figures show that the epidemic, which was at its height in January, abated considerably during February and March; that it again revived in April, and rose to a second maximum of fatality in June; that during September it greatly abated, and in October subsided to the minimum of the year; that in November the disease again renewed its activity, and that the year closed with as many deaths in December as there were in March. The monthly mortality, together with the rainfall, is shown in the subjoined statement:—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Cholera deaths	287	112	85	92	222	272	194	204	75	12	87	86	1,728
Rainfall .	3·00	6·40	3·60	2·70	0·00	0·00	15·30	10·00	9·60	0·00	0·00	2·50	53·10

In the preceding year the total rainfall at Ferozepore was only 28.60 inches; October and November, as in 1865, were rainless months, and the fall in December was only 0.30 inch. The high mortality in January was coincident with copious rainfall after a season of drought; the abatement in February occurred with unusually heavy rainfall saturating the soil and air with moisture, and was continued through March with that saturation still kept up by unusually heavy rainfall during that month. In April, with a smaller, but still unusually heavy, rainfall and increasing power of the sun, the saturation of the soil was diminished, and evaporation of moisture from its surface commenced activity, and coincidently with these changes cholera began to increase in prevalence. During May and June there was no rainfall, but the power of a midsummer sun upon a moist soil and dry air greatly intensified the activity of evaporation; and coincidently cholera greatly increased in prevalence during both months. In July there was a remarkably heavy rainfall, which not only served to quench the thirsty soil, but to partially saturate it also together with the air, now laden with the vapour clouds of the monsoon, so that the previously active evaporation of moisture

from the surface of the soil was considerably diminished; and coincident with these climatic changes there was a very marked check in the activity of cholera prevalence. In August the lesser rainfall under a still powerful sun gave some scope to recommencement of activity in the evaporation of moisture from the soil, and coincident therewith we find a tendency to somewhat increased cholera prevalence. But a continuation of heavy rainfall in September, with declining force in the power of the sun, again thoroughly saturated both soil and air with moisture, and very greatly impeded the process of evaporation; and coincident with this check to evaporation of moisture from the soil there occurred a marked abatement in the prevalence of cholera. In October there was no rainfall, but under the less powerful sun of this month the excessive rainfalls of the preceding three months sufficed to keep up a more or less saturated condition of the soil and air with moisture, and thus to retard the commencement of free evaporation; and coincident with this continued check to evaporation there was a continued abatement of cholera activity. In November also there was no rainfall; but by this time the saturation of the soil and air with moisture had considerably worn away, and evaporation again commenced to be active from an unusually damp soil, and with this change was coincident a revived activity of cholera. Finally, the rainfall in December, coming after two rainless months, was insufficient to saturate the soil, and only encouraged the limited evaporation possible at this season of the year, and coincident with this state of things cholera maintained its revived activity of the preceding month. This instance of cholera mortality and rainfall at Ferozepore well illustrates what I have frequently explained in previous passages, regarding the fixed relation of the prevalence of this disease to the nature of the rainfall in respect to its effects upon the soil, when examining the results furnished by an analysis of the general provincial statistics of cholera mortality and rainfall; and many other instances similar in detail are to be found in the district returns of the other provinces during the several years for which we have the statistics.

With the exception of Rawal Pindi, Shahpur, and Dera Ghazi Khan, all the districts returning cholera deaths during this year were affected by the disease in January; the mortality recorded in that month—in Kangra 19 deaths, in Dera Ismail Khan 12, Rohtak 9, Umballa 8, and Gujranwala 7—showing that cholera was at the beginning of 1865 actively present in these districts, probably as a continuation, in revived activity, of the previous year's cholera. Ferozepore apart (see Table No. I.), the districts of Amritsar, Kangra, Sirsa, and Umballa registered more cholera deaths than any of the others. The monthly figures (see Table No. II.) show the seasonal prevalence of the cholera of 1865 in the province as a whole. The periods of abatement were in March and October, and the season of maximum activity during May, June, and July.

The incidence of cholera in 1865 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section. For the first time registration of deaths among the civil population of this province was commenced in this year. The total of deaths registered from cholera amounts to 3310, or at the rate of 0.22 per mille of population. It may be fairly concluded that the mortality registered from cholera is much under the real amount of loss of life caused by the disease. The returns, so far as they go, show that the cholera of 1865 affected every district in the province, except the districts of Simla, Bannu, Jhang, Montgomery, and Muzaffargarh, the three last named being situate in an area

generally but little affected by cholera. The fatality of the disease, however, varied very greatly in the different districts.

The rainfall of 1865 (see Table No. V.) was nearly $3\frac{3}{4}$ inches above the average, and 6 inches in excess of that of the preceding year, and it was very unevenly distributed both locally (see Table No. VI.) and seasonally. In the Mooltan division and in the districts of Dera Ghazi Khan and Dera Ismail Khan the rainfall was so scanty as to cause serious loss of cattle and more or less distress among the agricultural populations of those parts. The rains of the year were unusually heavy in the first quarter, and correspondingly light in the second. In the third quarter the monsoon rains were in seasonable abundance, and those of the fourth quarter were also abundant. In the Ferozepore district, in which, as already noted, the cholera mortality was so severe, the rainfall of the year was exceptionally heavy.

Regarding the food-supply, there was a considerable rise in prices in 1865, and high rates continued throughout the year. The average price of wheat was 18.98 sers the rupee against 23.93 sers the rupee in the preceding year. It is recorded that, under the Sikh rule, if, in the large cities of the Punjab, wheat was selling at a maund (equal to about 80 lbs. avoirdupois) for the rupee, it was considered rather dear than otherwise. "Under British rule prices have rarely fallen so low; and during the past year, at Lahore, Mooltan, and Amritsar, wheat has sold at higher prices than when famine was last raging in the North-Western Provinces. This steady increase of prices, which was also noticed in last year's report, is due not so much to the deficiency of the supply, but to increased demand, and to the opening out of new markets." (Punjab Administration Report for 1865.)

It is worthy of note that with this steady increase in the prices of food there has also been a rapidly increasing prevalence of epidemic cholera in the Punjab, where the prices of labour have not advanced in equal proportion with those of food and other necessaries of life. There are no precise statistical data to establish the truth of the assertion of this increased prevalence of epidemic cholera, but the testimony of the people of the country is so unanimous on the point that there can be no doubt that the intervals between recurring epidemics of cholera in the Punjab have been much shorter in latter years than they formerly used to be. This increased prevalence of the disease in epidemic form may be accepted as an established fact; but whether the fact is dependent on the condition of the people in direct relation to their food-supply, or in more direct relation to the climate influences, which in the first instance affect that supply, is an interesting subject for consideration and inquiry. The evidence afforded in the pages of this history of the disease tends to the conclusion that both influences act together in the development of the periodical manifestations of epidemic cholera as we find them in India.

1866.—In this year, the first of the next triennial cycle 1866–68, cholera, instead of appearing with the usual periodically recurring cyclic epidemic revival, prevailed with much less activity than in the preceding year. Among the troops and jails there was no cholera mortality whatever recorded in 1866, and among the civil population the death-rate was only 0.06 per mille against 0.22 in the preceding year. This very marked abeyance of cholera activity in this province during 1866 was coincident with an improvement in the prices of food, though rates still continued comparatively high, and with a considerable deficiency in the rainfall, the seasonable distribution of which, however, was proportionally pretty even.

The monthly mortality returns indicate the presence of cholera during

the first three months of the year in most of the districts, excepting those of the Hissar and Dera Ismail Khan divisions. The mortality recorded in January in the Lahore and Gurdaspur districts, as also in the Sialkot district in February, and in the Karnal and Umballa districts in March, indicates somewhat more active manifestations of the disease in those districts than is recorded against any of the others during these three months. In the month of April there was a marked increase of cholera prevalence in the affected districts generally, and this continued without any very sensible rise or fall in the recorded mortality till the end of July; in August there was a marked decline in the mortality registered, and this was maintained at about the same level in September, but fell to about half in October, in which month the mortality was the same as that recorded in March, before the general activity of the disease commenced. In November the recorded mortality indicates a revived activity of cholera, the deaths registered in this month being on a par with the number recorded in April. The year 1866 closed with the continuance of this revived activity of cholera throughout December in most of the districts up to the River Indus, excepting the usually exempt areas of the Mooltan and Hissar divisions and the district of Ferozepore. This last-named district returns no cholera deaths in continuation of the violent epidemic of the preceding year, and appears to have remained absolutely free of the disease throughout this year. At the close of 1866 Delhi was the only district which showed cholera markedly prevalent, [illegible] returned from it in December, 58 deaths, being about half the total cholera mortality of the entire province registered in that month. The year 1866 began with 60 cholera deaths registered in January, and ended with [illegible] in December. The seasonal prevalence of the disease is shown in Table [illegible].

The incidence of the cholera of 1866 among the troops and jails in the Punjab is represented by a single admission and no death. It occurred among the European troops at Delhi—strength 380—in December.

Regarding the meteorology of this year, it is to be noted that the regular and systematic record of meteorological observations was commenced for the first time for this province in April 1866, in which month the meteorological reporter for the province entered upon his duties. No data of practical value are consequently available for this year. The rainfall of 1866, as already stated, was considerably in defect; it was only 24.35 inches, or 3 inches below the average, and 6⅔ inches less than that of the preceding year. Compared with the quarterly distribution of the rainfall in the preceding year, the rainfall in the first half of this year was more equally distributed between its two quarters than was the case with that in 1865 for the same periods. The rainfall of the third or hot-weather monsoon quarter, though somewhat less than that in the corresponding period of 1865, was nevertheless fairly abundant. In the fourth quarter, however, there is a very marked defect, the total fall being only 0.27 inch against 2.48 inches in the same quarter of 1865; this slight fall was, moreover, about 1⅛ inch less than the average fall in this period of the year. The drought which marks this last quarter of 1866 was prolonged, though with abating severity, into the first quarter of the following year, and forms a characteristic feature of the meteorology of the seasons immediately antecedent to the outbreak of the great epidemic cholera of that year.

The food-supply in 1866 was somewhat more abundant than in the preceding year. The prices of the principal food-grains were moderately low, and there was no deficiency or distress on this score. The average price of

wheat was 20.77 sers the rupee against 18.98 sers the rupee in the preceding year.

1867.—In this year, the second of the triennial cycle, cholera, instead of, as in the normal course, abating from the prevalence of the preceding year, prevailed with very greatly increased epidemic activity. Among the troops and jails together the death-rate was 8.89 per mille of strength against a blank in the preceding year, and amongst the civil population it was 2.45 per mille against 0.06 respectively. This severe and untimely activity of epidemic cholera was coincident with a slight rise in the prices of food and with a continued deficiency in the rainfall, which was, moreover, unseasonably distributed.

The incidence of cholera in 1867 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

The monthly mortality registered from cholera among the civil population of the Punjab in 1867 is shown in Table No. II., which exhibits the seasonal rise and fall of the mortality in the province as a whole. The monthly district returns show that every district in the province suffered from the disease, but in very different degrees of severity. The figures show that cholera was generally more active in the first three months of 1867 than in the corresponding months of the preceding year, the registered deaths being 69 in January, 36 in February, and 49 in March of the latter year, and 133, 83, and 296 respectively in the former. The greater mortality in these early months of 1867 was most marked in the Delhi district, and to a lesser extent in the Umballa, Ludhiana, Gurdaspur, Karnal, and Sialkot districts. Nearly all the districts up to the Indus, excepting those of the usually exempt areas in the Mooltan and Hissar divisions, show the presence of cholera in each of these first three months. Simla is the only district of this category which shows no sign of the presence of cholera before the month of April; Gurgaon and Ferozepore show the disease present only in January, Shahpur in January and again in March, and Jhelum in February and March. In the usually more or less exempt area of the Hissar division the district of Rohtak returned deaths from cholera in February, and the district of Sirsa in March.

With this general prevalence of the disease in the province east of the Indus during the first three months of the year, there occurred in April a general epidemic outbreak over the whole of the affected area east of the Indus, but it was in this month most severe in the country to the east of the Amritsar district. This commencement of epidemic cholera activity in April 1867 was coincident with the dispersion of the pilgrims from the great fair at Hardwar held in that month. The disease continued in epidemic prevalence during the succeeding months, and spreading southwards to the Mooltan district, and westward across the Indus, involved the whole province within the sphere of its activity by the end of June. In September the epidemic began to abate generally over the whole province, excepting in some of the Mooltan and trans-Indus districts, in which it was later in making its first appearance. By November the epidemic had subsided everywhere, and the year closed with only 46 cholera deaths in December against 133 with which it opened in January.

During April and May large numbers of the pilgrims returning to their homes from Hardwar fell victims to the disease on the roads and in the towns and villages on their several routes, and in many places they suffered more or less severely after they had reached their homes. In a large number of places these wayworn and weather-beaten people were the first to succumb

before the prevailing epidemic, and this circumstance gave rise to a general belief that they were the direct cause of the widespread diffusion and violent prevalence of the disease; that, in fact, they carried the disease about with them, and communicated it broadcast over the whole country. However this may be, there is no doubt that the mortality among the returning pilgrims very largely made up the total cholera mortality of the year in this province.

The Hardwar fair, and the circumstances connected with the outbreak of cholera among the assembled multitude there in 1867, has been described in a preceding passage; and it is only necessary in this place to note very briefly some of the leading circumstances relating to the appearance of the epidemic cholera of the year in the Punjab Province, so far as they are supposed to be connected with the Punjab pilgrims returning to their homes from the fair.

The following particulars are derived from the "Sanitary Administration Report for the Punjab for 1867," by Dr. A. C. C. De Renzy, Sanitary Commissioner for the Punjab at that time:—

"The Government of the Punjab," he writes, "knowing that the annual fair at Hardwar for April 1867 was to be a *Kumbh* fair" (the term *Kumbh* is applied to every twelfth fair), "and that it was likely to be attended by vast multitudes of pilgrims from all parts of Hindustan and of the Punjab, and foreseeing the dangers likely to arise to the public health from so great a concourse of human beings, many of whom would be destitute and exhausted by the fatigues of a long journey, addressed the Government of the North-Western Provinces on the 28th January, drawing attention to the necessity of special precautions being taken with a view to the prevention of cholera or other contagious disease. Further, on the 13th March a circular was addressed to all commissioners whose divisions lay on the pilgrim routes, directing that all practicable measures should be taken for carrying out proper conservancy arrangements at the different pilgrim encampments, for preventing undue crowding, and securing ample supplies of good and wholesome water. Commissioners were further instructed to arrange that immediate information should be conveyed to them of the appearance of cholera or any contagious disease among the pilgrims. In that event measures were to be taken for preventing the entrance of the disease into towns and cities by the establishment of quarantine, and also for providing medical assistance for those attacked.

"The Government of the North-Western Provinces organised a most perfect system of police, by which the greatest order was maintained, and the conservancy was so arranged that there was an entire absence of that 'intolerable stench' which was so much complained of in former years. The pilgrims were loud in their expressions of admiration of the systematic arrangements which afforded them so much comfort and security, and admitted of every one of them, no matter how feeble and helpless, having a bath in the holy Ganges on the great festival, a privilege for which thousands had travelled from the remotest parts of the province, and was only to be obtained in former years at great risk of life from being trampled under foot of the vast crowds pressing on in disorder to the sacred ghât. . . . They began to assemble in the last days of March, but the fair was not regularly open till the 3d April. From that date till the 12th, the great bathing day, the roads from every quarter were blocked up for many miles with a solid mass of humanity journeying towards Hardwar. The fair was believed to have been the largest ever held; a rumour had gone abroad that this would be the last of the *Kumbh* fairs, as before another twelve years elapsed the sanctity of the Ganges would have gone for ever. The report was very generally believed, and seems to have inspired vast multitudes with a frantic enthusiastic desire to participate in the last of a series of festivals which had been observed by countless generations of Hindus. It is said that the number of pilgrims present on the 12th April was little short of three millions, and this estimate is believed to be a very close approximation to the truth. A rough census of the people was taken as they passed through the enclosures which were erected to break the multitude into fragments, and so lessen the dangers of crushing on their passage to the ghât. This mass of people, nearly as numerous as the whole population of Scotland, more numerous than that of London, were collected on bare level sandy ground, and occupied a space of 25 square miles in the Hardwar plain. The density of the population was eighteen times greater than that of London; the superficial space per head was 26 square yards. The encampment was regularly subdivided into streets and lanes, with shops, in which an ample supply of good food was provided and mer-

chandise of every kind exhibited. Water was obtained from the Ganges, or, in parts of the camp remote from the river, from *pucca*" (masonry) "wells. The people lived in tents, or in neat, picturesque grass huts. The crowd rapidly increased till the great bathing day on the 12th noon, after which it suddenly dispersed. By the morning of the 15th the encampment had entirely disappeared. . . .

"Three hospitals had been established in convenient situations for the sick, but the admissions were very few. From the 3d to the 13th April there were 1352 patients treated, of whom 19 died—2 from diarrhœa, but none from cholera. On the 9th there had been a slight case of cholera in a grasscutter of the cavalry detachment, and the police had previously reported four cases as such. . . . Several cases of undoubted cholera occurred on the evening of the 12th. On the following morning the pilgrims began to disperse. . . . Each and every one of the streams of returning pilgrims had cases of the disease within one day's journey of Hardwar;" and they suffered, it might have been added, from cholera, in many instances, until and after their arrival at their homes in the most distant parts of the province.

"The simultaneous outburst of cholera," continues Dr. De Renzy, "on the evening of the 12th April in every section of the Hardwar encampment is a phenomenon of great interest. A disease which spreads by contagion extends itself gradually, and takes some time to occupy any considerable area, but in the present instance we find a great multitude which on the 11th April was so little tainted with cholera as to be believed to be quite free from it, thoroughly contaminated in all its parts on the 12th. . . . Dr. Murray" (Inspector-General of Hospitals, Upper Provinces) "suggests that the simultaneous appearance of cholera in every section of the pilgrims was due to atmospheric cause rather than dissemination from any individual source. On the night of the 11th there had been a great thunderstorm, with heavy rain, which lasted all night, and up to noon on the 12th. There was also a remarkable and sudden fall of the temperature that day, amounting to 14 degrees. Dr. Murray gives several instances where severe outbreaks of cholera were attributable to 'unseasonable showers.'"

The gradual and steady progress of the epidemic cholera of 1867 towards the north-west through the Punjab is illustrated in the subjoined tabular statement prepared by Dr. De Renzy, which shows the number of deaths registered from cholera according to the position of districts with reference to the great rivers.

Cholera Deaths in 1867.

Districts.	April.	May.	June.	July.	August.	September.	October.	November.	Total.
South of Sutlej . .	3,424	6,053	4,880	2,148	952	237	60	13	17,767
Between Sutlej and Beas	609	1,194	593	284	320	265	96	7	3,368
Between Beas and Ravi.	208	496	1,132	2,524	1,768	1,269	688	42	8,127
North of Ravi . .	38	435	1,697	2,732	3,277	1,938	117	204	10,438
Trans-Indus . . .	5	285	1,245	1,380	1,709	1,381	301	55	6,361
Totals . .	4,284	8,463	9,547	9,068	8,026	5,090	1,262	321	46,061

The figures show that cholera was active throughout the province in April, but that the disease attained its maximum intensity of prevalence later and later as the distance increased from the south-east towards the north-west, quite independently of the rate of travelling of the pilgrims returning to their homes from Hardwar. In the Punjab it was noticed that in every large station the first cases of cholera which were observed occurred in pilgrims; but, on the other hand, these pilgrims thus attacked with cholera were by no means the first or earliest pilgrims who had arrived direct from Hardwar in these several stations. On the contrary, they merely happened to arrive after many others had preceded them, and fell victims to the disease, in many instances simultaneously with the residents who had been at Hardwar, simply because their arrival happened to be coincident

with that of the cholera-producing influence steadily advancing towards the north-west, and because the circumstances of their bodily condition, exhausted as they were by privation, exposure, and fatigue, were such as to pre-eminently predispose them to the action of the cholera-producing influence. In the Punjab the jails suffered comparatively little from the general epidemic cholera of 1867, as has been already shown, only eight out of the thirty jails in the province being affected by the disease. In the hill sanitaria there were—at Simla 64 deaths from cholera, at Dharmsala 7, at Dalhousie none, and at Murree 193, including 10 Europeans of the civil population.

The following description of the Hardwar site, and of the great fair held there in April 1867, is taken from the detailed history of the great epidemic cholera of that year which is given in the "Fourth Annual Report of the Sanitary Commissioner with the Government of India." It is stated that the epidemic cholera of 1867 in Northern India is remarkable for its coincidence with the great fair held at Hardwar in the spring of that year. The year 1867 was a *Kumbh Mela* year, which recurs only every twelfth year, and is held in peculiar veneration by Hindus. The gathering of pilgrims consequently, as was anticipated and provided for, assumed an unusual numerical magnitude.

The town of Hardwar, population 18,739, is situated on the southern slope of the Sewalik range, at the mouth of the gorge through which the Ganges issues from the Himalayas, and is distant about 40 miles due east from Saharanpur. The town has an elevation of about 1000 feet above the sea, and stands on the west bank of the main of the two channels in which the river now flows at this spot, since the diversion of its waters from a third channel by the construction of the Ganges Canal. The main stream is now a deep, broad, and rapid river, and during the rainy season becomes a rushing torrent, the water of which is exceedingly cold, as it is largely derived from the melting of the snow on the mountains. The valley through which the river flows runs up north-east towards the foot of the main Himalayan chain, which is 13 miles distant from Hardwar, and is described as intensely malarious, abounding in dense jungle and swamps. The same condition prevails, but in a less degree, in the neighbourhood of Hardwar itself, where the surrounding country is low relatively to the bed of the river; so that the soil is very damp, and being covered with stunted verdure, rapidly generates malaria. The river at this spot is held in peculiar sanctity by Hindus, and from time immemorial an annual pilgrimage to Hardwar has been enjoined from all parts of Hindustan for the purpose of ablution in the sacred water. Every twelfth year is celebrated with peculiar rejoicings, and is called *Kumbh Mela*. A pilgrimage at these twelfth-yearly periods is considered the most fortunate and efficacious. In former times these periodical gatherings were often marked by much violence and bloodshed, owing to the contentions of the several sects of *fakirs* who congregated in vast numbers and fought for the ruling power. All this has been changed since the establishment of the British rule; and though the concourse of pilgrims is doubtless vastly in excess of what it was in former times, the *Kumbh Mela* is now marked throughout by harmony and order, in consequence of the police and other arrangements made by Government. In the fair of 1867 the gathering of pilgrims, as had been anticipated, was one of unusual numerical magnitude, and more than ordinary preparations had been made to provide for the safety and proper management of so vast a crowd of people by the organisation of special police, sanitary, medical, purveying, and other arrangements. About the middle of March many *fakirs*, shopkeepers, and pilgrims began to arrive. These pilgrims performed their ablutions, and departed before the turmoil and crowding which invariably attend the after-stages of the festival. A constant succession of arrivals and departures was thus kept up until about the end of March, when the multitudes showed less and less disposition to disperse as the great bathing day approached. During the first week of April, and on subsequent days up to the 12th, dense masses of pilgrims poured in from all quarters, and encamped in every direction for miles on both sides of the river. Noon of the 12th April was the auspicious hour and day for ablution, after which the stream of pilgrims flowed steadily from Hardwar.

The sacred bathing-ghât is thus described—

"The bathing-place of the pilgrims was a space 650 feet long by about 30 feet wide, shut off from the rest of the bed of the Ganges by rails, which prevented the people from

getting any further out into the river than the limits of the space which was thus enclosed. In this long narrow enclosure the pilgrims from *all parts of the encampment* crowded, as closely as possible, from early morn till sunset. The water within this space was, during the whole time, thick and dirty, partly from the ashes of the dead brought by surviving relatives to be deposited in the waters of the river-god, and partly from the washing of the clothes and bodies of the bathers, who were all decently, though lightly, clad. Now, pilgrims at the bathing-ghât, after entering the water, dip themselves under water three or more times, and then drink of the holy water whilst saying their prayers."

This water, it is to be noted, was that of a running river—the Ganges.

The Hardwar camp-ground consisted of a long strip 9 miles long by a mean of 3 miles broad, but about a fourth or fifth part of the area was unoccupied. The camp extended 9 miles along the course of the river, and varied in width from 2 to 6 miles. It was 13 miles distant from the hills. By a rough census of a portion of the camp, taken on the night of the 9th April, the number of pilgrims was calculated at 2,855,966 souls, encamped over an area computed to be 22 square miles. But including the pilgrims who had left prior to this date, and those who arrived subsequently, the total number attending the fair will more correctly be represented by 3,000,000.

At Hardwar in the early spring months there are great extremes of heat and cold. During the day the heat is very powerful, and at night a cold air from the snow-capped mountains rushes down the river gorge. Storms are frequent in the locality. The meteorological phenomena at Hardwar during the fair are thus stated—

The daily mean temperature during the week ending on the 14th April was 76°. The weather for some time previous was unsettled, but towards the end of March some rain fell, and it continued fair to the 11th April. On this day, which was sultry and cloudy, a storm, with heavy rain, thunder, and lightning, came up from the west in the afternoon, and produced a sudden and marked decrease of temperature. It rained heavily all night, and drenched the whole encampment. Rain continued to fall on the 12th up till noon. This was the great bathing day, "and the pilgrims, who had been wet for twelve hours, began before the dawn of day to stream off in thousands to the sacred ghât. The rain still continued to fall, though now only lightly; nor did it cease until the evening, when, just before sunset, the clouds broke and the sun for a short time came out. A vast number must have waited in a state of fatigue for twenty-four hours till the sun came ere they could have got any dry clothes on their bodies. On the following day, the 13th, eight cases of cholera were sent to the hospital." The winds in April were variable, though those having a westerly direction prevailed. The meteorological phenomena observed at Rurki, 17 miles from Hardwar, during April are summarised as "characterised by excessive dryness of the atmosphere, low barometric pressure, great and sudden alternations of temperature, westerly breezes, and absence of ozone; and these conditions existed prior to, and concurrently with, the fair."

It is stated that the health of the pilgrim camp was excellent up to the 12th April. "During the whole fortnight of the fair only 1367 patients were treated at the general hospitals, namely, 823 outdoor and 544 indoor patients, or about 1 in 2000, estimating the number of pilgrims at 2,500,000. Ague was the most common disorder among the pilgrims, the percentage being about 17 to the total treated. Intermittent and remittent fevers caused 6 deaths out of the 16 fatal cases which occurred. Bowel affections, taken collectively, show a total sick-roll of 308, or 21.9 per cent. of the whole. These cases comprised, diarrhœa 101, dysentery 79, colic 64, and dyspepsia 64. Towards the close of March 4 cases of severe diarrhœa were sent to the hospital, where they speedily recovered. Only 4 deaths from diarrhœa and dysentery occurred during the period under review. Among a long list of other diseases were a few cases of smallpox. Of accidental deaths there were 5, of which 2 were caused by lightning."

No case of cholera or smallpox is known to have occurred in the Dehra section of the camp up to the 14th April. But a case of sporadic cholera

occurred in a detachment of the 14th Bengal Cavalry stationed below Kankhal section on the night of the 9th April. The patient, a grasscutter, speedily recovered under treatment. No other case occurred in the regiment at Hardwar. Up to the 13th April the returns of all the hospitals and dispensaries at Hardwar showed an absence of the disease. But on that day 8 cases of cholera were sent to hospital, and up to the 15th there were 19 admissions from this disease. These were all the cases of cholera actually seen and treated at Hardwar. At former fairs, when cholera broke out, it destroyed the pilgrims in great numbers at Hardwar itself. Regarding the 1867 fair, "there is good reason to believe that, had the pilgrims continued at Hardwar for even a few days longer, the mortality among them would have been infinitely greater than it unhappily was." From noon on the 12th April the pilgrims had begun to depart, and the vast multitude dispersed with inconceivable rapidity. On the afternoon of the 13th the Bijnor section was empty, and not 300 people were left in the Dehra section; "and on the morning of the 15th the entire ground so lately covered by the encampments was a bare plain again."

The sanitary conditions of the camp are said to have presented a marked contrast to any previous gatherings which had ever been held at Hardwar. The encampment was singularly clean, and the arrangements for the disposal of all filth were actively and successfully carried out. Latrine filth was disposed of by burning in furnaces and by burial in trenches within the camp area. "As far as the senses could testify, there was nothing which could offend either sight or smell." In former years it was hardly possible to move in any direction on account of the filth, which lay about in every quarter.

Regarding previous outbreaks, it is stated that traditions exist to the effect that cholera broke out in the fairs of 1819 and 1829. Of the outbreak of cholera in the fair of 1783, which was also a *Kumbh Mela*, Dr. Jameson writes in his report of the cholera of 1817—

"It is the custom of the pilgrims to repair to the bed of the river, where they pass the night with little if any shelter, many persons being crowded together under the cover of a single blanket thrown out as an awning. The temperature is very variable, the days being hot and the nights cold, with heavy dews and sudden chilly blasts from the clefts in the mountains." In that year cholera "broke out soon after the commencement of the ceremonies, and raged with such fury that in less than eight days it was said to have cut off above 20,000 victims."

An outbreak of considerable severity occurred in the fair of 1857; but, with this exception, the disease appears to have been unknown at Hardwar between the years 1854 and 1866, or to have existed to so small an extent as to attract no attention.

Regarding the prevalence of cholera in the vicinity of Hardwar prior to the fair of 1867, the mortuary returns for the Punjab show that the disease was epidemic in the Delhi district during the first three months of 1867, and that it was also present in activity during the same three months in the Karnal and Umballa districts, as well as in most of the districts along the foot of the mountains up to the Indus. In the North-Western Provinces during the same three months cholera was epidemic in the Tarái, at the foot of the Kumaun Hills, and in the beginning of April was found to be actively prevalent in the Bazpur town, on the road to and only 50 miles from Hardwar. The death returns for this year both in the Punjab and the North-Western Provinces also show that the disease everywhere commenced an increased activity in April, the month in which it is usual for cholera in

Northern India to prevail with a renewed activity, whether the season be one of epidemic or non-epidemic prevalence.

The rainfall of 1867 was very deficient in amount and peculiar in its seasonal distribution. The amount was only 23.12 inches, or 1¼ inch less than that of the preceding year, and 4¼ inches less than the average annual fall. The seasonal distribution of the rainfall of 1867, compared with that of 1866 (see Table No. V.), shows a very marked defect in the first quarter of the year 1867 as compared with the rainfall in the same period of 1866, and the fall, moreover, was considerably less than usual in this period of the year. This defect, being in continuation of an even more marked defect in the preceding three months constituting the last quarter of 1866, produced a six months' drought, which was immediately antecedent to the outbreak of the epidemic cholera of the year 1867. The rainfall of the second quarter of this year was considerably more copious than that of the same period in the preceding year, and was coincident with the commencement of the epidemic activity of the cholera of the year, its fall upon a parched soil producing a rapid and free evaporation of moisture from the surface thereof. The monsoon rains of the third quarter were fairly abundant, but less than in either of the two preceding years, and less also than the average for this period of the year; and so far this defect favoured the continuance of free and active evaporation, neither the soil nor the air being surcharged with moisture. In the fourth quarter of 1867 the rainfall was 2½ times as great as that in the same quarter of the preceding year, though still three-quarters of an inch less than the normal fall for this period of the year; but in this quarter, with the naturally diminished temperature, the activity of evaporation of moisture from the surface of the soil was at a minimum, and coincident therewith the great epidemic cholera of the year rapidly subsided, and finally ceased.

The food-supply of 1867 was somewhat dearer than in 1866, the average price of wheat being 19.39 sers the rupee against 20.77 sers the rupee respectively. It is stated that the prices of the principal food-grains in this province generally were high in 1867, and that the rates of unskilled labour ranged from two to five annas (or from 3d. to 7½d.) a day, and of skilled labour from four to twelve annas (6d. to 1s. 6d.) a day. During the year there was a considerable rise in rates in places affected by the railway and other public works, and labour in any shape commanded higher remuneration than formerly; but as prices of the necessaries of life had risen in even a higher ratio, owing chiefly to the increased facilities for export, it is doubtful whether the position of the unskilled labouring classes had materially improved. ("Punjab Administration Report for 1867.")

1868.—In this year, the third of the triennial cycle, cholera subsided to a minimum of epidemic prevalence, as was due in the normal course for this year of the cycle. Among the troops and jails there was no mortality whatever recorded from cholera in 1868, and among the civil population the death-rate from the disease was only 0.03 per mille of population. This great decline in the epidemic prevalence of cholera was coincident with an increased scarcity and higher prices of food than in the preceding year, and with a very remarkable defect in the rainfall of the year, the seasonal distribution of which was such as to reduce the evaporation of moisture from the surface of the soil to a minimum; so that, notwithstanding the unfavourable conditions of the food-supply, epidemic cholera was unable to flourish in the absence of the climatic conditions favourable to the development of its activity.

The total number of cholera deaths registered among the civil population in 1868 amounted to 532, and this number was contributed to in varying proportions by every district in the province (see Table No. I.), excepting Mooltan, Jhang, Dera Ismail Khan, and Kohat, which recorded no cholera mortality at all; the largest number of deaths was returned by Kangra, 114, and the lowest by Simla and Dera Ghazi Khan, 1 each. The returns show a complete subsidence in all parts of the province of the great epidemic cholera of 1867. The monthly mortality of the year (see Table No. II.) shows a decline from January to February, then a steady rise to the maximum of prevalence in May and June, and thereafter a subsidence to August; then another rise to a second maximum of prevalence in October, followed by subsidence to the close of the year.

Regarding the meteorology of the year, it is recorded, in respect to temperature, that—

"The mean temperature of the Punjab in 1868 was nearly 75° F., or about 1° higher than in the preceding year. During the early part of 1868, however, as rain was more frequent, the mean temperature in many places was considerably lower than in the same period of 1867. From the month of January to the end of June there was a gradual increase in the monthly temperature; but the total increase reckoned for each month differs considerably; and this is the case in every year. Thus the mean temperature in February is ordinarily 5° higher than in January; in March there is a further increase of about 6°, in April of 12° or 13°, in May of about 12°, and in June of about 6°. In July, owing to the setting in of the rains, the temperature falls about 4° or 5°. In the succeeding months the mean temperature of September is about 3° less than that of August. The fall from September to October is about 11°, from October to November about 11½°, and from November to December about 10°. The mean temperature for December, as represented by the results of observations at the seven stations of Bahawalpur, Dera Ismail Khan, Shahpur, Rawal Pindi, Sialkot, Lahore, and Ludhiana, is about 56°."

In respect to *wind*, it is stated that—

In 1868 "during the cold months the wind varied between west and north-west; southerly winds were the exception in most stations, and westerly winds the most frequent up to the month of May, when easterly winds began to be more frequent. From June to August the wind was variable, but mostly easterly. In most stations the wind was more variable during 1868 after May than was the case in 1867. To this circumstance, and to the unusually heavy rain in the cold weather of 1867, may perhaps be attributed the scarcity of rain at the proper season in 1868. In Mooltan south-westerly currents seem to bring most rain. On the frontier north-easterly and south-easterly currents may be looked upon as the most rainy."

The rainfall of 1868 was only 20.65 inches, or about 6¾ inches less than the average falls, and nearly 2½ inches less than the fall in the preceding year. The seasonal distribution, compared with that of the preceding year, shows a greatly increased fall in the first quarter of 1868, viz., 5.33 inches against 2.04 inches in 1867, and 1½ inches in excess of the average fall in this period. This excessive fall, which followed a deficient fall in the preceding quarter, the last of 1867, was succeeded, in the second quarter of 1868, by a fall of 4.75 inches, which was a little more than that in the same period of 1867, and was, moreover, a quarter of an inch in excess of the average for this portion of the year. Thus in the first six months of 1868 the rainfall was considerably in excess, by about 1¾ inches, of the average fall in this half of the year; so that the soil was more than usually at this season saturated with moisture, and the temperature of the air more than usually diminished. The entire defect of the rainfall of 1868 fell upon its last six months. In the first half of this period, or the third quarter, the fall was only 9.89 inches, or nearly 6 inches less than the fall in the same period of 1867, and 7½ inches less than the average. This light fall succeeding the heavy falls in the preceding

quarters was calculated, under the action of a midsummer sun, to favour free and rapid evaporation of moisture from the surface of a previously damped soil, and probably it did so to the limited extent of that moisture, which was not, however, sufficient to call forth the development of any great amount of epidemic cholera activity. The same remarks apply, with due allowance for the difference in season, to the rainfall of the fourth quarter, which, whilst much the same in amount as that of the same period in 1867, was also much (three-quarters of an inch) less than the average. Thus it may be stated that the heavy rainfall in the first half of 1868 was sufficient by its amount to saturate the soil and air with moisture, and thus keep down evaporation to a minimum of activity, whilst that of the second half of the year was insufficient by its amount to produce more than a very mild and limited degree of evaporation of moisture from a scarcely wetted soil; and further, that in both periods the conditions, thus restraining the free play of evaporation, conduced to the production of a state of climate inimical to the development of epidemic cholera activity; and this notwithstanding that the circumstances of the food-supply in this year were such as to favour the increased prevalence of epidemic cholera, had the disease developed into this form of activity. The effects of the drought during the last half of 1868 will be seen in 1869 under a very different kind of rainfall, both as to amount and as to seasonal distribution.

The food-supply of 1868 was much less than that of the preceding year, and there was a considerable rise in prices. The average price of wheat was 15.93 sers the rupee against 19.39 sers the rupee in 1867. Up to the middle of the year 1868 the prices of the principal food-grains, it is stated, were comparatively low; but after the month of June they rapidly rose to famine rates, owing to the prolonged drought. "During the early months of 1868 so considerable a quantity of rain fell that it was feared that the regular rainy season would be unfavourably affected by it, and this fear was unhappily realised. The summer was unusually hot and dry, and during July and August only a few showers fell—too light to be of much benefit to the crops, which were rapidly withering. . . . The grass was burnt up, and the plough-cattle began to die in great numbers." The districts to the south of the Sutlej suffered most severely. The district of Karnal suffered most severely of all, and next the districts of Hissar, Sirsa, and Rohtak. In all these very extensive relief was afforded by the Provincial Government. In the districts to the north and west to the River Ravi there was no distinct distress, nor were relief works of any magnitude instituted. The general scarcity and distress continued to the close of the year 1868, and passed on into the succeeding year.

1869.—In this year, the first of the new triennial cycle 1869–71, there was a distinctly marked increase in the prevalence of cholera; in fact, the periodically recurring cyclic cholera epidemic had appeared in the normal course, although with less than the usual amount of severity experienced in the first year of the course of a cyclic cholera epidemic, so far as is shown by the mortality returns for the civil population, whilst those for the troops and jails show the incidence of the disease amongst those classes to have been at a rate of severity normal to this year of the epidemic cycle. Among the troops and jails together the cholera death-rate in 1869 was 9.77 per mille of strength against a blank in 1868, and among the civil population it was 0.53 per mille against 0.03, respectively. This great increase in the epidemic activity of cholera in this year was coincident with great scarcity of the food-supply and famine prices of food, and with a rainfall greatly in excess

of that of the preceding year, the seasonal distribution of which was such as to produce periods of very free and active evaporation of moisture from the surface of the soil.

The incidence of cholera in 1869 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

The mortality returns of the civil population show that cholera was generally present and active during the first three months of the year in all parts of the province as far to the north-west as Gujrat; the only districts that return no death from cholera during these three months are Simla, Sirsa, and Ferozepore. The trans-Indus districts of Peshawur and Hazara show the presence of the disease in March; whilst the other trans-Indus districts, and those of the Mooltan division, manifest a complete absence of the disease during this period, as also do the districts of Rawal Pindi, Jhelum, and Shahpur. From January to March the provincial monthly mortality steadily increased from a mild commencement in February (see Table No. II.); in April the increase was greater, and marks the commencement of epidemic activity in almost all the districts previously affected. In May epidemic activity was established in most of the previously affected districts, and the disease appeared also, for the first time in this year, in several districts previously unaffected. During the succeeding months the disease maintained a moderate degree of epidemic prevalence over the province generally, but with very different degrees of intensity in its different parts. Thus the districts of the Mooltan and Dera Ismail Khan divisions—with the exception of an isolated outbreak in Montgomery during June, and an unimportant indication of the presence of cholera in Mooltan in September, in Dera Ghazi Khan in May, and in Dera Ismail Khan in that month, and again in August, and an epidemic outbreak in Bannu late in the season—show a marked immunity from the prevailing epidemic, the district of Muzaffargarh remaining free of the disease throughout the year. In the districts of Simla, Jullundur, Ferozepore, Rawal Pindi, Jhelum, and Shahpur the disease is represented by the registered mortality as fitful and mild in the manifestations of its activity. In the other districts the disease pursued a more or less steady and active epidemic course, attaining its period of maximum fatality in different months in the different parts of the province; in Peshawur and Kohat not till September and October respectively, when it suddenly burst out with considerable violence. In the districts of Amritsar and Peshawur the disease prevailed with very marked severity, the combined mortality of these two districts alone being 6593 against 9258, the total cholera mortality of the year for the whole province. In Gurgaon, in the Delhi division, the total deaths were 636, and in Kohat, in the Peshawur division, 508—the two districts being situate at opposite extremes of the province. In Hissar the total deaths were 301, in Lahore 297, in Gurdaspur 155, and in Bannu 124. The above are the districts in which the cholera of 1869 prevailed with the highest registered mortality (see Table No. I.)

The death returns show, as is exhibited in Table No. II., that the cholera of 1869 steadily increased in fatality month by month from January to August, in which latter month the mortality reached its climax by a great leap from that in the preceding month. This was caused by the sudden and violent increase of epidemic cholera in the Amritsar district, adding 2653 deaths to the provincial figures in this month; the high figures in September and October were caused by the sudden and late epidemic outburst of cholera in the Peshawur district, adding respectively 1704 and 1155 deaths to the

provincial mortality, together with 499 deaths in Kohat in October. The large number of deaths represented in the provincial figures for the months of September and October is due to the late appearance of the epidemic in the Peshawur and Kohat districts; excluding the cholera deaths reported from Peshawur and Kohat in September (1704), October (1155 + 499), and November (99 + 8) from the provincial totals for those months, the decline from the culminating point of mortality in August will be represented by 687, 379, 97, and 80 deaths respectively in the several succeeding months, instead of by 2391, 2033, 204, and 80, as shown in Table No. II.; and this is more in accordance with the usual seasonal deportment of cholera in this province.

Regarding the epidemic cholera of 1869 in the city of Amritsar, the following particulars are gathered from the "Sanitary Administration Report for the Punjab for 1869," by Dr. A. C. C. De Renzy, Sanitary Commissioner for the Punjab :—

Some doubtful cases of cholera had occurred in the city of Amritsar earlier in the month, but it was not until the 27th May that the first case of genuine cholera was recognised by the civil surgeon. After that date cases of cholera were of almost daily occurrence in the city, but they were not numerous in any one place. The disease was first recognised in a ward situated in the south part of the city, and next in a ward in its north part. The number of deaths in any one day in June never exceeded four, and the total deaths recorded from cholera in that month were 83. The disease was confined to no particular quarter, but isolated cases occurred in all directions. During the early part of July the number of daily deaths returned from cholera continued small and fluctuating, but generally more numerous than the daily casualties in June, and they occurred chiefly in the south-east part of the city. On the 13th July the daily deaths began to increase, and from the 15th to the end of the month ranged from 17 to 37 daily, the disease being still chiefly confined to the south-east part of the city. From the 1st August the disease was generally diffused over the whole city; the daily mortality rapidly increased, and on the 16th August attained its culminating point with 118 deaths, and then rapidly abated, and finally ceased on the 21st September, though the last reported case occurred on the 8th October. The only rainfall recorded in June was on the 8th of the month, when 4.40 inches were measured. In July there was no rainfall recorded until the 15th of the month, when 0.10 inch was registered; this was followed by 1 inch on the 16th, by 1.30 inches on the 18th, by 1 inch on the 21st, 1.50 inches on the 22d, 0.20 inch on the 23d, 1.50 inches on the 26th, 0.50 inch on the 27th, and 0.10 inch on the 31st. In August rainfall was recorded only on the 7th, namely, 0.20 inch; on the 19th, 0.50 inch; and on the 23d, 0.60 inch. In September the falls were 0.80 inch on the 4th, 0.30 inches on the 5th, 0.90, 0.60, and 0.60 inch respectively on the 10th, 11th, and 12th, and finally 2.20 inches on the 25th.

The jail, situated inside the city, was affected by cholera on the 10th August, notwithstanding the facts that "the prisoners were carefully guarded by quarantine, their employment outside the prison wall discontinued, and overcrowding prevented." The first case was that of a prisoner who had been in jail ten months; "he had seen no visitor, and was apparently not exposed to infection from without. He was taken ill suddenly in the yard of the prison in the day-time. The next case was on the 17th, and next three cases on the 18th. The prisoners were then moved into camp, 2 miles from the city, and there one case occurred on the 20th, and another on

the 22d. Of these seven patients, six died. These men were all occupants of Barracks No. 13 and 16."

The police force of the district consists of 987 men, of whom the municipal are 496. The district police, 491 in number, had not a case; the municipal had 20 cases, of which 13 were fatal. "These men, when off duty, reside very much with their families in the city, and therefore, although seven died in one barrack, which is surrounded and undermined by sewers badly flushed, it is impossible to decide whether they were infected in their own houses or in the barrack." In the civil station there was little cholera. "Of the Europeans, numbering about 200, none were attacked; 19 cases occurred among the Native population." The fort of Govindgarh, distant one mile from the city walls, was held by 134 English soldiers, half being artillerymen, and the rest of H.M.'s 92d Highlanders, who are periodically relieved. The first case was that of a gunner, on the 6th August, followed by 8 more cases up to September 3d. All but 2 were in the artillery. The total English population in the fort was 144, of whom 134 were men, 5 women, and 5 children. Among the men there were 8 cases and 6 deaths; among the women 1 case and 1 death. The children escaped altogether.

Shortly after the subsidence of the epidemic of cholera, or, as Dr. De Renzy writes, "after a short lull, fever of a very low type caused for many weeks a mortality hardly less than that of the cholera." The following description is given of the city and its situation :—

The city of Amritsar is built round a hollow in the central drainage of the Doab, and stands on a plain at an elevation of 770 feet above the sea. The centre of the city is somewhat higher than the outskirts, and the level of the country rises from thence in every direction, except towards the south, in which direction there is a fall of a foot in a mile. The city is built upon a stratum of a rather impermeable clay 5½ feet thick, under which lies an unknown depth of sand, striated with thin beds of clay interspersed with nodules of kankar. It has only existed as a town of importance for about a century and a half, and has risen into importance as the religious capital of the Sikhs; and owing to its situation being convenient for the trade between the hill states and the countries to the east, its imports are second only to those of Delhi, and its manufactures are the most valuable of any city in the Punjab. Its population on the 10th January 1868 was 133,925, composed very equally of Hindus and Muhammadans. It is enclosed within walls about 20 feet high, and has a circumference of about 5 miles, its longest diameter being 1¾ miles; its area is nearly 900 acres, of which 570 are built upon, and of the rest several large spaces are cultivated. The most densely inhabited portion of the city has a population of 520 persons to the acre; the average population per acre is 158. It contains six tanks filled from the Bari Doab Canal, and has, besides, within it several hollows, locally called dhâbs, of which the Aluvalian and Bhangian ditches are the most important. They cover several acres in area, and receive the drainage and sewage of the tracts around them; their depth varies from 10 to 14 feet. The city is surrounded by a ditch, which is about 100 feet distant from the wall, and receives the drainage of the outer margin of the city. The drinking-water is chiefly obtained from wells, of which there are 1025, yielding water at 24 feet below the surface. They are not infrequently in contact with the drains or surrounded by marshy hollows. Some of them are cleaned out once in every two or three years, but a large number had not been cleaned within living memory.

An analysis of specimens of the water taken from various parts of the city was made by the chemical analyst. Commenting on this analysis, Dr. De Renzy recorded the following among other observations :—

"It appears that, while the quantity of common salt contained in water taken from uncontaminated soil outside the walls of the city ranges from seven-tenths of a grain to 2 grains per gallon, the city water contains from 4 grains to 189 grains per gallon. Again, the city waters, of which nineteen were submitted to examination, without one single exception, contain one or other or all of the following substances in considerable

quantity, viz., ammonia, nitrous acid, nitric acid, phosphoric acid, and sulphuretted hydrogen. The pure water outside contains no trace of these substances. The total weight of the dissolved matter in a gallon of the extra-mural pure water was 21 grains. In one of the intra-mural waters the quantity was 478 grains, and from 40 to 50 grains in the general average. . . . In order to ascertain whether the impurity of the well water was due to the presence of unclean substances introduced through the well mouth, which, as is well known, is almost invariably uncovered, I have had several specimens of water submitted to analysis which were obtained by the use of a Norton's tube-pump fixed in different parts of the city. By this contrivance water was procured whose dissolved matters could only be derived from the soil; one of these waters contained 50 grains of dissolved matter per gallon; a second 43 grains; a third 55 grains; a fourth 310 grains. They were, in fact, no better than the open-well waters. A remarkable circumstance occurred on three occasions when the tube was being sunk in the soil. When it had got down about 5 feet, all of a sudden there was an overpowering rush of foul gas from the tube, a sickening stench, which compelled the workmen to run away to some little distance. . . . The filthy state of the soil taints the air and water of the place and makes it pestilential."

Like most Oriental cities, Amritsar consists partly of narrow streets flanked by shops and expensive brick houses of several storeys in height, and partly single-storeyed mud huts aggregated around a common enclosure, which allows no passage through them.

"The main streets are rarely above 20 feet wide, and the side alleys as narrow as 6 or even 4 feet. The greater portion is paved with small bricks set in sand. The larger streets have two side gutters, and the alleys one down the centre. The street and side houses are raised above the general level, the back-yards being at such a low level that water cannot flow out of them. An average mud hut may be 9 feet by 9 feet by 7 feet, and has no ventilation except through the doorway, having neither chimney nor window. The average number of inhabitants is four. Of these four one supports the rest, and his earnings are about 8s. a month. This sum during the past year would have bought 96 lbs. of flour of an inferior grain, and consequently the cheaper vegetables, such as pumpkins, melons, cucumbers, carrots, and turnips were much eaten. Fully 50,000 of the population subsisted in this manner."

The conservancy system is on the dry principle.

"The sweepers who are maintained by householders carry the daily filth down to the place of junction of the lanes and bazars, and the sweepers maintained by the contractor clean the bazars and streets, and remove the above heaps into the carts. The chief deposit of filth is about sunrise, and its collection cannot commence till about an hour later. It is therefore not out of the city till 9 or 10 A.M. The human ordure is, most of it, removed, but the accumulation of refuse of all kinds in private enclosures is very large, and becomes very offensive in hot weather, more especially after rain."

It is recorded that the city of Amritsar has experienced many epidemics of cholera. Those within living memory are stated to have occurred in the years 1805, 1813, 1827, 1845, 1856, 1862, 1865, 1867, and 1869. The loss of life in the earlier epidemics was not recorded. In 1867 the number of deaths registered from cholera amounted to 1488; in this year the number was 3012, or at the rate of 22.50 per mille of population. The district of Amritsar comprises the three subdivisions of Amritsar, Taran-Taran, and Ajnala, which, exclusive of Amritsar city, have an aggregate population of 698,825. In this population the deaths registered from cholera from June to October were 545, or at the rate of 0.70 per mille, but the mortality was very unequally distributed in the three subdivisions. In Amritsar, excluding the city, the death-rate was 1.20 per mille, in Taran-Taran 0.60, and in Ajnala 0.30. In Amritsar there were 23 towns and villages in which 5 or more cholera deaths were registered, in Taran-Taran 6, and in Ajnala 2. In Amritsar there were 89 towns or villages in which less than 5 cholera deaths were registered, the aggregate number of deaths being 139; in Taran-Taran

the figures were respectively 47 and 68, and in Ajnala 37 and 57. In Amritsar the majority of the villages attacked were within a few miles of the city, and a large proportion of the places attacked in the other sub-divisions were on much-frequented lines of traffic. The disease did not appear simultaneously in the different places attacked; some places were attacked in July, the majority in August, and a few not till September.

In the Lahore district, which adjoins that of Amritsar on the west, there were only 297 deaths registered from cholera throughout the year. In Lahore itself the first case observed occurred at the railway station on the 22d July in a traveller just arrived from Amritsar. The disease was for some time confined to places in close proximity to the railway station, chiefly to the Sultan sarai, which is a rest-house where travellers from all parts put up, and to the Changar Mahalla, which is a quarter inhabited by a very poor class of people. "The disease was next recognised in the part of the city (population 85,346) nearest to the sarai, viz., that portion inside the Delhi gate, and it appeared stationary for a short time in the filthy alleys of that quarter. By-and-by cases began to appear in different parts of the city, and no part altogether escaped." There were 210 deaths registered, or 2.45 per mille of population. In the civil station there were 48 deaths, viz., 8 in Anarkali, population 9831, and 40 in Landa bazar, near the railway station, population 3389. It is related that "one American missionary died. He had arrived only two or three days before he was seized from Sabathu, where the disease was epidemic. A native Christian who attended upon the missionary was seized the day after the death of the latter. He recovered, but his wife also was seized the same day, and died." Among the police at Lahore there were 6 cases, with 3 deaths. The police in the district had no cases at all. There was a severe outbreak in the Lunatic Asylum. It commenced on the 5th September, and from that date to its close on the 30th September there were 44 cases, with 33 deaths, in a population of 222 lunatics. The disease fell with especial virulence on the female lunatics, of whom 20 were attacked, or 48 per cent. of the whole number, viz., 41. Among the establishment attached to the asylum, consisting, with their families, of 84 persons, there was not a single case of cholera. In the female penitentiary there were 2 cases, both fatal. In the Lahore central jail, with 1900 prisoners, there was no case. In the 8 villages within municipal limits there were 8 deaths from cholera. In the district of Lahore, which, excluding the city and its suburbs, contains a population of 676,985, there were only 14 deaths registered from cholera during the months from June to October, and there was not a single village in which so many as 5 cholera deaths were registered.

With regard to the epidemic cholera of 1869 at Peshawur, the following particulars are derived from the same source as the preceding accounts:— The disease was epidemic in the district in September, October, and November. Its origin was not traced, but it is stated that the district was in more than usual active intercourse with the districts to the east of the Ravi River, owing to a brisk exportation of grain to the lower portions of the province, where famine prices prevailed all through the hot weather.

In the districts lying between Lahore and Peshawur the monthly returns of mortality show that cholera was prevalent in epidemic form during August in Gujranwala, and deaths from the disease had been reported in each of the preceding four months both from Gujrat and Jhelum, each of which districts also showed signs of the presence of cholera in August, the former recording 7 and the latter 1 death from the disease in that month. The intervening

district of Rawal Pindi showed no sign of the presence of cholera since the preceding May, in which month 2 deaths were registered.

At Peshawur the first signs of the presence of cholera appeared towards the latter part of August, when several cases were reported in and near the city, viz., a woman in the city on the 23d August, and a child in the Landi suburb on the same day; a man on the 29th, and a woman on the 31st, both in the city, in different wards of which they were respectively residents. On the 31st August the first case recognised as genuine cholera occurred, and "from that date the disease spread rapidly through the city, and by the middle of the month it had appeared in different parts of the district." The last case was registered on the 10th December. The total number of deaths registered in the city from September to December inclusive was 1466, or 25.90 per mille of population. In the early portion of the year great efforts had been made to improve the sanitary condition of the city, and large accumulations of filth had been removed. The city during the epidemic "had quite attained to the standard of cleanliness usual in Native cities. The radical defect, however, of the place—its loathsome water-supply—was, of course, untouched." In some of the low parts of the city, which received the drainage of higher portions without having a sufficient outlet for it, the disease appeared to be unusually virulent.

In the military cantonment and civil station of Peshawur, adjoining the city, the first case of cholera which was recognised occurred on the 5th September, on which date 3 cases, of which 2 were fatal, occurred in the bazar. On the 8th September the first case among the troops occurred, a man of the 18th Bengal Cavalry being the victim. The first case among the European troops occurred on the 11th September, on which date, at 12 noon, a soldier of H.M.'s 36th Regiment was attacked, and died the same day. He was in a weakly state of health from fever, and being "a convalescent, had not been out of his barrack for several weeks." About two hours subsequent to this case two men and a woman of H.M.'s 104th Regiment were attacked. A wing of this regiment left the station on the 13th for Cherat, and escaped the epidemic with only 3 seizures and 2 deaths. The artillery were attacked on the 12th and 20th. In the city the 13th was the day on which the greatest number of deaths took place, viz., 92. Among the non-military residents of cantonments cholera caused 360 deaths in September and 47 in October, and gave a death-rate among them of 35.30 per mille; but even this rate is supposed to be below the reality, "as there is reason to believe that many deaths that were really due to cholera were registered by natives under other heads, in order to evade the duty of having their houses cleaned, fumigated, &c." The jail was attacked on the 14th September, when there were 4 cases. "The disease clung to the prisoners till the 5th November." There were altogether 27 cases and 13 deaths in a population of 411, or 31.60 per mille.

The water-supply of the cantonment and jail is derived partly from wells, but chiefly from branches of the Bara cut—"open-surface canals into which latrines, urinals, wash-houses and cook-houses drain. The aggregate length of the cuts is 52 miles. The average breadth of the streams is from 2 to 3 feet, and they contain 3 or 4 inches of water. At times, when the river is low, only a portion of the station can be supplied at one time; on these occasions the water is temporarily cut off, and the dry filthy bed of the stream gives off a most offensive stench."

The weather which preceded the outbreak was very hot; in August the rainfall was only one-tenth of an inch. The air was extremely dry all

through the month; its mean humidity was only 39, saturation being 100. The first nine days of September were also extremely dry; the mean humidity was only 40. On the night of the 9th–10th September 2.30 inches, and on the 10th 4.40 inches of rain fell; altogether 6.70 inches—an unusually heavy fall for Peshawur. After that the air became more moist, and the mean humidity of the whole month was 64.

"The form of the Peshawur valley is defined by a range of hills of a semicircular shape, with the base open at the Indus. The greatest length of the valley is about 54 miles, and its average width about 22. The movement of air is believed to be very slow, and it is apt at times to be almost entirely arrested. . . . There is a slight general slope from the northern and southern borders to the centre of the valley, through which the Kabul River flows from west to east. The valley is a lake-basin formed on the Kabul River and Indus, and lies at an elevation of about 1100 feet above sea-level. Its strata are composed of alluvial clay, more or less mixed with sand, overlying beds of sand and pebbles composed of the debris of rocks similar to those of the surrounding hills. In this last stratum the well water is found. In Peshawur cantonment the soil is a remarkably impervious clay, having little or no sand." Three principal rivers enter the valley—the Kabul from the west, the Swat from the north, and the Bara from the south-west. The level of the subsoil water varies much in different places. In the Doaba and Dandzai subdivisions it is a few feet from the surface, while in the Yusufzai plain to the north, and the Mahmand upland to the south, it is generally at a considerable depth below the surface; at the extreme south-west of the cantonment it is 113 feet, and on the ridge occupied by the cantonment it ranges from 60 to 90 feet, more or less. The western division of the valley is very extensively irrigated from the three principal rivers that flow through it, and whose beds in this part of their course are little below the surface of the ground. There is much swampy ground in this division, and cultivation is carried on almost entirely by the aid of canal irrigation. In the eastern division the rivers flow between higher banks, from 20 to 30 feet below the surface. There is no swamp and no river irrigation here; cultivation is dependent on rainfall or well-irrigation. In the epidemic of cholera in 1869 the western division suffered much more severely than the eastern, and this has always been the case, so far as is known, in previous epidemics also. In two of the registering circles in the western division 80 and 81 per cent. of the villages were attacked by cholera, and in none was the percentage less than 8. The highest percentage in the eastern division was $23\frac{1}{2}$; it occurred in the Taru circle, which is freely irrigated from a channel from the Kabul River. The next highest percentage occurred in the Akora circle, where it was $11\frac{1}{2}$. In the Yusufzai subdivision the Mardan percentage was $8\frac{1}{3}$, and here the mortality registered occurred chiefly in the adjacent villages of Hoti and Mardan; in the Rustam and Katlang circles the percentage was only $2\frac{2}{3}$, and in Swabi no single village returned any death from cholera.

In the Kohat district, which adjoins that of Peshawur, as soon as the presence of cholera in the latter was known, quarantine stations were established at the two principal passes between the two districts, and all travellers, whether ill or not, were detained at them for seven days under observation, to their no small discomfort, and a complete failure in excluding cholera. The disease was first recognised in the station of Kohat on the 29th September, on which date a prisoner who had been in jail since the previous June was attacked with cholera. He was one of a small party of prisoners "who used to go out of the jail every morning to wash paper pulp in the stream

which flows through the station." The disease first appeared in the cantonment on the 2d October, and reached its acme on the 10th, when there were 14 deaths registered from cholera; but it continued very virulent up to the end of the month; the last death registered occurred on the 6th November. In the town of Kohat 163 cholera deaths were registered in a population of 6064; in the cantonment 165 in a population of 5210, or 31.60 per mille. One European officer and one European child died of the disease. "The disease appears to have been very virulent among the dispensary servants, for from the Native doctor to the sweeper hardly any one escaped an attack."

Regarding the case in the jail it is recorded—"In the jail, which is in the midst of the city, only one convict was attacked." (A second case was shown in the hospital register, but this, on inquiry, Dr. De Renzy found was not genuine. It occurred in a dropsical patient, who was subject to occasional attacks of diarrhœa, and recovered.) "The barracks were very much overcrowded at the time, the number of convicts being 150. Nor is this the first time the jail has escaped an epidemic attack. In the epidemics of 1858, 1862, and 1867 there was not a single case among the prisoners." This remarkable exemption is attributed by Dr. De Renzy to the fact that "the water-supply is derived from a deep well perfectly protected;" and he contrasts the exemption of the convicts in 1869 with the losses of the jail establishment, "who out of a total strength of 42 had 3 deaths."

In the Gurgaon district, to the south-east of Delhi, and at the opposite extreme of the province, the cholera of 1869 prevailed more or less during every month of the year, December alone showing no death registered from cholera. From May to November the disease was epidemic, the highest mortality being registered in August, September, and October; but at no time was the epidemic very severe, the total cholera deaths for the year being 636 in a population of 690,522, or 1.54 per mille. Each of the five subdivisions of the district returned deaths from cholera. (1.) *Jharsa* returned 18 deaths from the town of Farukhnagar, population 10,631, and 11 deaths from 9 villages in a population of 116,601. (2.) *Rewari* returned 6 deaths from Rewari town, population 24,503, and 17 from 17 villages in a population of 121,377, or one from each village. (3.) *Nuh* returned 87 deaths from 6 towns, population 11,599, and 42 from 25 villages, in a population of 130,477. (4.) *Firozpur* returned 163 deaths from 14 towns and villages, population 15,606, and 54 deaths from 33 other villages, in a population of 106,415. (5.) *Palwal* returned 6 deaths from Palwal town, population 12,729; 35 from Dhati, population 2288; 47 from Seoli, population 2062; 13 from Hodal, population 7032; 53 from 4 other towns, total population 9757; and 42 from 25 other villages, in a population of 119,487. The diffusion of the disease is thus shown to have been very general in this district, and to have been more fatal in the Firozpur, Nuh, and Palwal subdivisions; these are distinguished from the other two by the saline character of their well waters. A large portion of the Nuh and Firozpur subdivisions consists of marshy land. "In the rains the drainage of the hills collects in lagoons on the low ground, and remains some months, in some places the whole year round. Fresh water is obtained from this source or from wells drawing their supply from it, but at bottom the whole of the well water may be said to be saline, and as a rule it is not used for irrigation. . . . In the direction of Farukhnagar, the seat of the salt manufactories, there are abundance of wells containing an excessive quantity of salt, but this does not affect the character of the water used for drinking, as it is quite common to find a perfectly sweet well within 100 or 200 yards of a salt well."

In the Hissar district the cholera of 1869 pursued a course very similar to that described in Gurgaon. Of its five subdivisions, (1.) *Fatahabad* returned 42 deaths from Khamarai, population 850, and only 7 from 5 other villages in a gross population of 79,616. (2.) *Hissar* returned 52 deaths from Hissar town, population 14,133; 76 from Sewani, population 4053; 26 from Balsamand, population 2333; 43 deaths from 5 other towns with a conjoint population of 5024; and 14 deaths from 10 villages, in a population of 81,899. (3.) *Hansi* returned 30 deaths from Jamalpur, population 2194, and 4 from 3 villages in a gross population of 124,120. (4.) *Bhiwani* returned a single death from 1 village, the population of the subdivision being 104,170. (5.) *Barwála*, population 66,199, returned no death from cholera.

No comprehensive statistics, beyond those relating to the rainfall, are available to illustrate the meteorology of the province in this year. Some observations on temperature, pressure, and wind are, however, recorded.

"*Temperature.*—The mean temperature during the earlier months of the year 1869 was much less in some stations than it had been for the same period during the two previous years. This was more particularly the case with frontier stations, as also with Rawal Pindi and Sialkot. The months of April and May presented throughout nearly all the province a uniformly higher mean temperature in 1869 than during the two previous years. The cause of this is doubtless the smaller amount of rain during these months in 1869 than during the previous periods. The mean temperature of June and July 1869 was, on the whole, less than during the same months of the two previous years, on account of the greater fall of rain. In August 1869 the mean temperature was much the same as during the same month of the previous year—both being almost uniformly higher than that of August 1867, during which month much rain fell. September 1869, however, shows a lower mean temperature and much more rain than the same month of the two previous years. The cold weather came on more rapidly in 1869 than in the two previous years, and in many stations the maximum temperature was very much less than during the last three months of the two previous years. The unusual amount of rain in September 1869 was doubtless the cause of this. The daily range of temperature during 1869 differs in many interesting particulars from that of the two previous years. During the first three months of 1869 a considerable amount of rain fell, especially in March, and consequently the daily range of temperature was less. In some stations, indeed, the range was, during March, as much as 10°, 12°, and even 18° *less* than during the same month of the two previous years. April and May, however, presented greater ranges, being drier; June and July did not present much difference; but August 1869, on the whole, showed a greater range than the same month of 1867 and 1868. Not so with September 1869, however, on account of the greater amount of rain, as previously noted. There is not much difference observed in the range during the months of October and November in the year under review, but during December 1869 the range mostly exceeded that of any of the two previous years during the same month.

"*Barometric and Wind Phenomena.*—During the first three months the wind blew most frequently from directions lying between north and west, but during barometric depression it often came from easterly directions. This was more particularly the case towards the end of January 1869, the second and third weeks of February, and particularly so during the first week of March. In April the wind became more variable, but still more frequently westerly, changing, however, as in the previous months, to an easterly direction during great barometric depressions. In May the wind was more frequently northerly, often veering round to eastwards, as in the two previous years. From this month to the end of September the wind had an easterly tendency, while towards the end of the year it gradually turned northward and westward. Such is generally the case in the Punjab. During the most rainy periods (July and September) of the hot weather of 1869 easterly winds almost constantly prevailed, while during the previous year, during the rainy season, the winds were very various, to which circumstance is no doubt due the greater scarcity of rain at all proper times."

The rainfall of 1869 was 27.65 inches (see Table No. V.), or 7 inches more than that of the preceding year, but the amount was about the average annual fall for this province. Its seasonal distribution was very uneven, and well calculated, under the views I have expressed on the subject, to favour the

development of epidemic cholera activity. In the first quarter the fall was 7.12 inches, or nearly $3\frac{1}{3}$ inches in excess of the average, and though it followed a deficient fall in the preceding quarter, the last of 1868, was sufficient to saturate the soil. In the second quarter the fall was only 1.85 inches, or about $2\frac{2}{3}$ inches less than the average; this defect, with the increasing temperature of the season, tended to an active evaporation of moisture from the previously saturated soil; and under these circumstances the epidemic cholera of the year, which made but very slow and very slight progress in the preceding quarter, now commenced to advance with more rapidity and energy (see Table No. II.) In the third quarter the fall was 17.83 inches, or but very little more than the average; but it came in succession to a fall in the preceding quarter which was considerably less than half the average, and thus fell upon a more or less thirsty soil, so that evaporation had free play. With these conditions the epidemic cholera of the year made great and rapid increase, and in conformity with the rainfall; thus in July the fall was 8.20 inches, following upon the defective fall of the preceding quarter, and the cholera deaths rose to 797 from 194 in June; in August the fall was only 3.29 inches, thus allowing of free evaporation from the previously damped soil, and the deaths rose to 3238 in that month; in September the fall was 6.35 inches, and this unusually heavy fall for this month tended to saturate both soil and air with moisture, and thus to check the free play of evaporation, and with this condition the activity of cholera received a very marked check, the deaths in September falling to 2391. In the fourth quarter the fall was only 0.85 inch, or more than half an inch less than average, and 0.63 inch of the amount fell in October; this defect favoured, during the early part of the quarter, when the sun was still powerful, free evaporation from the soil, moistened by the unusually heavy fall in September; and with this condition cholera continued to prevail with considerable epidemic activity, the deaths in October being 2033. With the approach of the cold weather, however, and the natural decline in evaporation, cholera rapidly ceased activity, and the epidemic subsided.

The food-supply in 1869 was very scarce, and famine rates prevailed throughout the year; the average price of wheat rose to 11.32 sers the rupee against 15.93 sers the rupee in the preceding year. It is stated in the "Punjab Administration Report for 1869–70" that wages "varied little, if at all, from those prevailing in the previous year. . . . It is clear from the above that the rate of wages in the Punjab is not readily adjusted according to the price of food; hence the pressure of scarcity is more severely felt by the labouring classes here than in countries where wages are less regulated by custom." In many parts of the province, especially in the south-eastern districts and the Peshawur frontier, there was much distress, caused by scarcity of food, high prices, and want of agricultural employment.

1870.—In this year, as normally due in the second year of the cycle, there was a marked abatement in the epidemic prevalence of cholera. Among the troops and jails there was no mortality whatever recorded from the disease in 1870, and among the civil population the death-rate was only 0.03 per mille. This abatement in the prevalence of the epidemic cholera of 1870 was coincident with a considerable improvement in the food-supply and cheaper rates, and in a great defect in the rainfall, which in amount and seasonal distribution bore much resemblance to that of 1868.

The returns show the cholera of 1870 to have been very generally diffused over the province, every one of the thirty-two districts recording the disease, excepting Mooltan, Jhang, Muzaffargarh, and Kohat, which show

an entire immunity throughout the year. Though thus generally diffused, the cholera of 1870 in the Panjab nowhere assumed epidemic activity; yet it was very persistent over the area of the province generally, deaths being recorded in every month of the year, more especially in Gurgaon, Karnal, Umballa, Kangra, Gurdaspur, Lahore, and Gujrat. The seasonal rise and fall of the disease in the province generally is shown in Table No. II.

The only semblance of epidemic activity in the cholera of 1870 in this province occurred in the Gurgaon district in the month of June. The place affected was the village of Ghelab, population 827, in the Nuh circle, where 43 persons were carried off by the disease in the course of thirteen days. Inquiry into the circumstances attending the outbreak elicited the following statement:—

"The first person who died was an old woman, who went to Mathra with a number of others of the village about the 6th June. She commenced vomiting on the way back at Kossi, but was able to reach home, after which she died in the space of two hours. The next persons who were taken ill were her relations and neighbours. In short, all the persons who died lived within twenty paces of her house, with the exception of a family of sweepers, seven of whom died, and who lived 400 paces off. They appear to have caught infection from their having taken some of the clothing of those who died. No tank-water had been used for two months previous, as the tank had gone dry in April. The people who died of cholera obtained their water from a well . . . in which the water is about 72 feet from the surface. The soil around is a hard clay, not readily permeable to water, and there is no hole or pit for some distance from it. No rain fell at Ghelab previous to the outbreak of cholera, although rain did fall during the time it prevailed to the extent of 1.40 inches. An official was sent to Kossi to inquire whether cholera had been prevalent there, but he could not learn that it had. Also the collector of Mathra states that he was not aware that at the date in question any cholera existed between Kossi and Mathra."

The date of the first showers of the above rainfall is not stated, but it is clear from the account that the rainfall occurred during the time of the outbreak, and that it fell upon a soil parched by two months of previous drought, thus giving rise to free and active evaporation of moisture from its surface. The district mortality returns show 6 cholera deaths registered in May, 3 in April, 1 in March, and 4 in January; the disease was therefore occurring in the area at different times and places from the commencement of the year. The Ghelab outbreak, however, was evidently of purely local origin.

As already stated, there was no cholera mortality recorded among the troops and jails in this province during 1870, but some cases of the disease occurred among the European troops and their families. Thus among the European troops at Umballa, strength 1257, there was a single case, which recovered, in April; and among the families of the European soldiers there was a single admission, which proved fatal, among the women, total average strength 1068; it occurred at Delhi, strength 20, in April.

Regarding the meteorology of the year 1870 in the Punjab the meteorological reporter writes—

"That as a general rule, to which, however, there are many local exceptions, a rainy cold season is the precursor of a partial failure of rain in the proper rainy season, and *vice versâ*. . . . Another interesting point is to be noted, viz., the geographical distribution of the rain for each year." In this latter connection it is shown from observations recorded at six stations situated at considerable distances from each other in point of latitude, and without any very notable exception, that the more rain the southern districts receive the less falls to the share of those more to the north. This rule would seem to hold good for the monthly amounts during the rainy season more than for the annual falls. Of all the cold months March would appear to be the most rainy. If much rain falls during this month, little or none falls during the next two. This was the case in 1869. Delhi presents a local exception in 1870, which was not, however,

shared by the neighbouring districts, as, for example, Gurgaon, Hissar, Rohtak, and Sirsa, wherein the fall was scanty.

Temperature.—In the subjoined statement is shown the mean of the mean temperature of the four stations, Lahore, Rawal Pindi, Dera Ismail Khan, and Sialkot, for the four years 1867–70, together with the mean difference between each month :—

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Mean of the mean temperature of the four stations for four years, 1867 to 1870	53·3	58·5	65·3	76·8	89·0	93·5	91·5	88·8	86.1	76·4	63·6	54·7
Mean difference between each month	−1·4	+5·2	+6·8	+11·5	+12·2	+4·5	−2·0	−2·7	−2·7	−9·7	−12·8	−8·9

The monthly increase of temperature from January to June is greatest in April and May, and the monthly decrease from July to December is greatest in November. January is the coldest month, and June the hottest.

Humidity.—From the observations of relative humidity at the four stations mentioned before for the same four years, it appears that April, May, and June are the driest months. The air of the colder months, being denser than during the warmer, shows a relative higher humidity. During the rainy season the month of August would seem to possess the highest relative humidity. The month of August 1868 was one of low relative humidity throughout the whole province ; so likewise was the same month of 1869. During both months the rainfall was very small compared with that of August 1867, or even with that of the same month of 1870. Matters were reversed in September 1869 ; in this month there was an unusual amount of rain, and a consequent high humidity, owing mostly, no doubt, to evaporation from the earth's surface. Of all the stations of the province in which meteorological registrations have been kept, Mooltan is driest at all times and seasons. Next in point of dryness comes Rawal Pindi, if we except the low humidity of Lahore during April and May of 1870. Judging from the observations recorded in Dera Ismail Khan, the humidity is greater in the north-west frontier in the last three months of the year than elsewhere in the province, "and it is this greater humidity which favours the continuance of an invasion of cholera in that part of the country after it has mostly ceased in the more southern parts."

The rainfall of 1870, both as to amount and seasonal distribution, much resembled that of the year 1868, the only marked difference being a lesser fall in the first and a greater in the third quarters of the latter year.

The food-supply in 1870 had somewhat recovered from the famine prices which prevailed in 1869 ; the average price of wheat was 14.39 sers the rupee against 11.32 sers the rupee respectively.

1871.—In this year, the last of the triennial cycle, cholera subsided to a minimum of prevalence, and the periodic cholera epidemic which commenced in 1869 terminated its cyclic course in the normal way. The incidence of cholera in 1871 among the troops and jails is shown in the abstract in the tabular statements at the head of this section. Among the civil population the death-rate was 0.02 per mille. This marked subsidence of the activity of epidemic cholera in 1871 in this province was coincident with a continuous improvement in the food-supply and cheaper rates, and with an increased rainfall, the seasonal distribution of which was such as to produce no great amount of drought until the last quarter of the year (see Table No. V.)

The mortality returns show that the cholera of 1871 in this province pursued a course very similar to that followed by the cholera of 1870, but with a difference of just 100 fewer deaths registered. The same districts present a persistent prevalence of the disease in both years, and with about much the same proportionate excess of mortality over the other districts. The provincial figures show that the cholera of 1871 was present generally in the province in every month of the year, but nowhere in epidemic form, except in the Delhi district towards the close of the year, when 47 deaths were registered against a total of 58 in the whole district for the entire year.

The seasonal prevalence of the cholera of 1871 is shown in Table No. II. The spring minimum of mortality fell in February, and the autumn minimum in October; the hot-weather maximum was reached in June, and the cold-weather maximum, equally great owing to the Delhi outbreak, in December. In 1870 the only district that showed any sign of epidemic cholera was that of Gurgaon, immediately to the south of Delhi, where there was a local outbreak of the disease in June of that year, as already noted. The general abatement of cholera activity in the Punjab during 1870 and 1871 was not limited or peculiar to this province; it was observed to obtain throughout almost every part of India. In the Punjab during these two years the greater number of the deaths recorded were chiefly reported in remote rural circles until towards the close of the year, when the disease suddenly broke out in epidemic form in the suburbs of the city of Delhi.

The following particulars of this local outbreak are gathered from the account given in the "Sanitary Report for the Punjab for 1871," by Dr. J. Fairweather, the Officiating Sanitary Commissioner for the Punjab. Before entering on the details, however, it is necessary to note here that the district mortuary returns show deaths from cholera in the Delhi district, as well as in that of Gurgaon, adjoining it on the south, and in that of Karnal, adjoining it on the north, in most of the preceding months of the year. In the months from March to June inclusive all the three districts recorded one or more cholera deaths in each month; in July only Gurgaon and Karnal recorded cholera; in August neither of the three recorded any cholera mortality; but in September all three again record cholera; in October, again, neither of the three records cholera; whilst in November once more all three record cholera mortality, though Delhi almost monopolises the deaths registered. In October, then, all three districts were apparently free of cholera; nor was the disease heard of anywhere nearer than Lucknow, where it was known to be prevailing with considerable fatality during the months of October and November. In Delhi the first notice attracted by the disease was towards the end of November, when it suddenly broke out with explosive violence in a restricted area in one of the western suburbs of the city, situated 400 or 500 yards outside its Lahore gate, between the night of the 28th and the morning of the 29th of that month.

The particulars of the outbreak are briefly these—

On the south-west side of the Sadr bazar suburb of Delhi city, and separated from it by a shallow sandy ravine, is a quarter occupied principally by tanners, but also by a smaller body of weavers and low-caste people called Kanjar, Nat, &c. This quarter occupies a projection from the rocky ridge which runs north-west and south-east on this side of Delhi, and is somewhat elevated above the Sadr bazar. The houses were of the usual mean order used by the poor people, and were built of mud or of the rough stones strewn about the surface of the ridge; and the ground on which they stood was formed of little but the bare rock, with only a few inches of gravelly soil and debris covering it. The trade of the tanners "is a very filthy one, and the ground around their huts is strewn with the bones of dead animals, which have apparently been dragged there for

their skins, the carcases being left to be devoured by wild animals; while the interior of their houses, which usually consists of a small courtyard, is occupied by the pits in which the skins are tanned. As this state of matters has been going on now for many years in the same spot, the whole of the locality has become saturated with filth, and the stench proceeding from it was quite overpowering."

On the 26th November 1871 one of the tanners gave a feast on occasion of the death of his brother, who had died on the 20th of that month. The feast was attended by a large number of the man's caste-fellows and a few of his neighbours, the Kanjars and Nats. "All the male portion of the tribe who were able to attend, to the number of several hundreds, were present, and having eaten their fill, they each carried home portions of the food to their wives and children; so that nearly every man, woman, and child partook of it. Nothing occurred until the evening of the 28th, when some of them began to be seized with vomiting and purging, and by the following morning 47 had been seized with all the symptoms of virulent cholera, of whom 13 were found dead in their houses when the outbreak was discovered." The daily seizures and deaths were reported as follows:—

From 6 P.M.	28th November	to 6 P.M.	29th November	—Seizures	47	—Deaths	15
,,	29th ,,	,,	30th ,,	,,	3	,,	8
,,	30th ,,	,,	1st December	,,	14	,,	8
,,	1st December	,,	2d ,,	,,	6	,,	7
,,	2d ,,	,,	3d ,,	,,	1	,,	2
,,	3d ,,	,,	4th ,,	,,	2	,,	5
,,	6th ,,	,,	7th ,,	,,	0	,,	1
	Totals, 9 days				73		46

These 46 deaths include 2 which occurred on the 4th December, viz., one a merchant from Bikanir, who was passing through Delhi, and "lodged not far from the scene of the outbreak" when he was seized; and the other a woman who lived at "no great distance" from the tanner's quarter. The rest of the deaths were exclusively confined to the tanner caste, and to the few outsiders who joined in their feast. As at the time of this outbreak it was in contemplation to form a "Camp of Exercise" in the immediate neighbourhood, "a regular inquiry, at the request of His Excellency the Commander-in-Chief, was made into the nature and quality of the different articles of food consumed at the feast, since it was universally believed the outbreak was caused by the putrid flesh of some dead animal, such as a camel or bullock, which these people are known to have no scruple about eating, and which was supposed to have formed part of the feast." The food consisted of rice, dâl or lentils, ghi or clarified butter, sugar, and spices; and as a large quantity was required for such an assembly, the articles had chiefly been purchased wholesale. Portions of the different articles which had remained over what had been cooked for the feast were produced; they were pronounced by all present to be of perfectly good quality, and several pariah dogs were fed for some days exclusively on these articles without any appearance of being affected injuriously thereby. "The rice and dâl were cooked by being boiled in three large tinned copper vessels; and although these, on inspection, were, perhaps, not so well tinned as they might have been, they were not worse than many I" (Dr. Fairweather) "have seen in use without bad consequences; and, moreover, the symptoms of the disease were too plain to admit of their being confounded with those of copper-poisoning."

Notwithstanding this expression of opinion, however, it is to be noted that the disease is shown to have been almost exclusively confined to those who partook of the food cooked in these vessels.

Much pains were taken to trace a connection between this sudden localised outbreak and the water-supply. Specimens of the waters of seven wells in and about the scene of the outbreak were examined by the chemical examiner, Lahore, who, giving the results of his analysis, writes—

"As might be expected in a long-inhabited place, the total matters appear large in all. The chlorides were in large amount in all except No. V., which dissolved contained the least. No. VII. was an abominable water, and it is difficult to understand how it could be drunk."

With regard to this analysis Dr. Fairweather writes—

"It is but right for me to say, however, that the specimen of water numbered VII., and characterised by Dr. Center as abominable and difficult to understand how it could

be drunk, is the well from which the water was taken to cook the rice and other articles for the feast. . . . Though, therefore, the water used in cooking the food has been described as of such an objectionable nature, the fact that it was largely used by other people in the neighbourhood without bad consequences entirely exonerates it, even though the water had not been boiled in the process of cooking, from the suspicion of being the source of the cholera poison, although it may, I do not deny, have had *some* share in the outbreak."

The weather at the time of the outbreak,

"As usually happens at this season in the Punjab, had been exquisitely clear, dry, sharp, and bracing, with a steady, sometimes strong, westerly wind blowing some time previously to the outbreak."

Inquiry elicited the fact that the cholera brought to notice by this sudden outbreak was not the first appearance of the disease in Delhi.

On the 25th November a Mr. M——, photographer, left Lucknow, "where cholera was then prevalent, and where an acquaintance of his, whose house he often visited, had recently lost a child from that disease." He remained in Cawnpore that night, and came by train next day, reaching Delhi about 7 P.M. of the 26th. He was quite well on arrival, had dinner, with some cauliflower, and went to bed. In the morning, when his servant brought him his usual cup of tea, he asked for a little brandy and water instead, as the cauliflower, he said, had disagreed with him. About 8 A.M. he was seized with all the symptoms of cholera. The dak-bungalow in which he lay is situated within the walls of the city, and is at least 2 miles from the locality of the outbreak already described, and which occurred on the following day.

It was now discovered that the tanner, on the occasion of whose death the feast of the 26th was given, had himself died of cholera on the 20th November, though the death was returned as from fever. His surviving brother, who gave the feast, stated that—

The deceased "had been in perfect health up to the evening of the 19th November, that he had eaten a hearty evening meal, and had gone to bed, but that in the middle of the night he was seized with vomiting and purging, and died before mid-day on the 20th. He further admitted that the food cooked for the feast had been piled on a palm-leaf mat in successive portions as turned out from the cooking vessels." This mat was spread on the floor of the room in which his brother had died on the 20th, and on which he had vomited and purged during his illness. Being blind, he never went further from his own house than a few yards to the place where he was usually employed in pounding bark for tanning.

Next was made the discovery that on the 18th November a boy, aged 10, had died of genuine cholera in a house about 500 paces from that in which the tanner died on the 20th.

The boy had been seen by the Native doctor of the Sadr bazar dispensary, and his case had been duly entered as one of cholera; and further, the Native doctor stated that he had reported two other cases of cholera, which had come to his knowledge before the outbreak, to the civil surgeon.

Further inquiry elicited that several cases of cholera had been reported to the police as far back as the 3d November, and it became quite clear that a series of isolated cases of cholera were occurring in Delhi and its suburbs for fully three weeks before the great outbreak, although none of the deaths resulting were registered as from cholera. Thus on the 3d November 1871 a report was brought to the Kazihauz police station about 11 A.M.—

"That ——, wife of ——, aged about 30, had been attacked by cholera during the night, and had just died." The police officials visited the spot, and ascertained that the woman "had eaten stale food about noon, and in the evening had been attacked with diarrhœa and vomiting. Her mother and friends administered medicine, but she took worse, and died next morning." In this case, it is stated, an inquest was held, and the usual report in sudden deaths sent in. "No report, however, was made to the civil surgeon, and the body was allowed to be buried without that officer's hearing of the

case;" but precautionary measures were resorted to, such as burning the clothes, fumigating and mud-washing the house. On the same day another report was made at the police station to the effect "that during the night ———, wife of ———, had been attacked with cholera, but that she recovered, and was well again." The police visited the house, and ascertained that the patient "had also eaten stale food (rice), and had suffered in consequence, but was all right again."

On the 8th November a report was brought to the police station in the city—

"That ———, wife of ———, aged 70, had been attacked by cholera on the 6th, and died about twelve at night. On the 7th the body had been disposed of in the usual way." The police visited the house in which deceased died, inside the city, and ascertained from her brother, a Hindu shopkeeper, that she "had taken ill with cholera the day before yesterday (viz., the 6th), had purging and vomiting, and died yesterday, the 7th, at about twelve at night. The body had been disposed of. The clothes, which had been made over to the sweeper, were taken away from him and destroyed."

On the 19th November a woman of the potter caste reported at the Paharganj suburb police station—

"That her daughter ———, aged 12 years, had been seized with symptoms of cholera, and had pain in the stomach and bowels, accompanied with vomiting. She got some cholera pills, and recovered."

Next day, 20th November, a man of the weaver caste reported at the same police station—

"That his son ———, 8 years of age, had cholera (purging and vomiting). He had been seized at 9 A.M., and died the following day."

From the above it appears clear that cholera existed in the close vicinity of the tanner's quarters for nigh three weeks before the death of the man on the 20th, on account of whom the feast of the 26th was given. At the request of Dr. Fairweather, a census of the Reghar caste (to whom the feast was given) of the tanner population was taken, and with them were included the Kanjars, Nats, and sweepers who died. The proportion of seizures and deaths among them, according to age and sex, is given as in the subjoined statement:—

	Men.	Women.	Boys.	Girls.	Total.
Reghar population, including Kanjars, Nats, and sweepers who died	247	201	118	92	658
Number of seizures among above	23	19	21	8	71
Percentage of seizures to population	9·31	9·45	17·79	8·69	10·80
Number of deaths	17	11	12	4	44
Percentage of deaths to seizures	73·91	57·89	57·14	50·00	61·98

From this list two deaths of persons who did not partake of the feast are excluded. The columns for boys and girls include infants at the breast. The deceased included with the Reghar population were 1 Kanjar, 2 Nats, 2 sweepers, and 1 chamár. The women and girls did not attend the feast, but merely partook of such portions of it as were brought home by their male relations.

In the subjoined statement is shown the number of seizures and deaths, according to age and sex, of those who partook of the feast each *twenty-four* hours after the commencement of the outbreak:—

Twenty-four Hours Period.	Seizures.					Deaths.				
	Men.	Women.	Boys.	Girls.	Total.	Men.	Women.	Boys.	Girls.	Total.
6 P.M. 28th Nov. to 6 P.M. 29th Nov.	19	8	16	4	47	8	2	4	1	15
,, 29th ,, ,, ,, 30th ,,	2	0	0	1	3	5	1	1	1	8
,, 30th ,, ,, ,, 1st Dec.	2	7	3	2	14	1	4	2	1	8
,, 1st Dec. ,, ,, 2d ,,	0	4	2	0	6	0	2	4	1	7
,, 2d ,, ,, ,, 3d ,,	0	0	0	1	1	1	1	0	0	2
,, 3d ,, ,, ,, 4th ,,	0	0	0	0	0	2	1	1	0	4
Totals	23	19	21	8	71	17	11	12	4	44

The people assembled to the feast at 11 A.M. on the 26th November, and dispersed to their homes about 1 P.M. Some of them who ate of the feast "began to get sick at stomach on the afternoon of the 28th; but it was not till after midnight on that day, or sixty hours after the feast," that the real outburst took place. "As usually occurs, the majority of the seizures were in the early hours of the morning, and about 66.9 per cent. of all seizures took place within the first few hours of the poison manifesting itself. There was a lull on the second day of the outbreak, only 3 seizures occurring; and then a fresh outburst took place on the third day, 14 being seized. On the fourth day 6 seizures occurred; on the fifth day 1; and then the outbreak abruptly terminated." The two fatal cases excluded from the above list, as not having partaken of the feast, occurred on the sixth day (4th December). Inquiry was made as to whether any of the others who partook of the feast suffered from diarrhœa or other symptoms of choleraic poisoning, but no cases of diarrhœa among them were discovered, and many of the tanners questioned on the subject "all denied having felt different in any way from what they did after eating an ordinary meal."

The room in which the tanner died on the 20th November "was occupied from the time of his death up to the day of the feast by his brother, who used the same bed on which he died, and by an old man, who was said to have slept regularly every night on the bare floor both before and after the other's death; yet no bad consequences to either ensued," until the brother "afterwards was one of the first victims of the outbreak."

Such are the circumstances which have been recorded in connection with the cholera-producing influence in the locality at the time that the feast took place, and predisposed a large number of persons within a limited area and period to the operation of the existent cholera-producing influence.

It has already been stated that among the troops and jails the cholera of 1871 affected only the Native troops. The incidence of the disease among the Native troops, total average strength 25,172, was altogether 4 admissions and 2 deaths, giving a death-rate of 0.08 per mille of strength. Of the 26 stations occupied by these Native troops the 4 following recorded cholera in 1871, viz., Hazara, strength 513, admissions 1 and deaths 1; Mardan, 897, 1 and none; Bannu, 1737, 1 and none; and Derah Ismail Khan, 1677, 1 and 1 respectively.

The most important meteorological features of 1871 were the early setting-in of the rainy season, especially in the southern and eastern districts, and the comparative scarcity of rain in the districts more to the west. The rainfall of this year was 25.38 inches, or 2 inches less than the average, but $5\frac{1}{4}$ inches more than that of the preceding year. The fall in the first two quarters was copious, especially in the second quarter, in which the excess was

owing to early commencement of the hot weather rains. In the third quarter the fall, though below the average, was still abundant, and coming after the heavy falls in the two preceding quarters, tended to keep up the equilibrium of humidity in soil and air, whilst the reduction of temperature by the copious falls in the second and third quarters offered less than usual cause of disturbance in the relation between the moisture of the soil and that of the air.

The food-supply in 1871 was much more abundant than in the preceding year, and prices became comparatively cheap. The average price of wheat was 19.20 sers the rupee against 14.39 sers the rupee respectively.

1872.—In this year, the first of the new triennial cycle 1872–74, the periodical cyclic cholera epidemic made its appearance in due course, and, as will be seen in the sequel, pursued its career through the successive years of the cycle in the normal regular order of maximum intensity in the first, abatement in the second, and subsidence in the third year. In 1872 the death-rate from the disease among the troops and jails together was 6.57 per mille of strength, and among the civil population 0.50 per mille. This great increase of cholera activity in 1872 was coincident with an unusually abundant rainfall and with food at comparatively cheap rates.

The incidence of the cholera in 1872 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

Among the civil population the cholera mortality of 1872 is shown by districts in Table No. I., and by months in Table No. II. The figures in the monthly mortality returns show that the cholera of 1872 was a new revival of the disease in the month of April, and that it prevailed with more or less of epidemic severity in all parts of the province, except in the usually exempt areas of the Mooltan and Dera Ismail Khan divisions, until the month of October, when the disease abated everywhere, and ceased entirely in December. At the close of 1871 the cholera of that year, which had throughout presented only a succession of sporadic cases widely diffused over the province and generally persistent through all the months, suddenly, in the month of November, developed into a local epidemic outbreak at Delhi, as has been already described. The mortality caused by this local outbreak raised the provincial deaths in November and December to higher figures than they otherwise would have been, and thus interrupted the steady decline of cholera activity from the maximum of prevalence attained in June of that year. The year 1872 opened with a continuance of the abatement of cholera observed in the latter half of the preceding year, and this was maintained without any very material rise in mortality during the two succeeding months. But in April, the figures show, there commenced a very marked activity of cholera in most of the districts situate to the eastwards of the River Ravi. In May this activity rapidly attained epidemic intensity in the Karnal and Umballa districts, and steadily increasing in the other eastern districts, extended also to several districts to the westward of that river. In June cholera was generally active as far west as the Indus, but only in the districts lying under the range of the Himalaya, those away to the south—the districts of the Mooltan and Dera Ismail Khan divisions—remaining exempt. In July there occurred a very marked check in the progress of the epidemic (see Table No. II.); the mortality, which had risen from 98 in April to 1073 in May, and stood at 978 in June, suddenly fell in July to 489; this was coincident with an unusually heavy rainfall in that month, and will be noticed again in a subsequent passage. In August cholera resumed its activity with redoubled energy in the districts previously affected, and crossing the Indus,

broke out with epidemic violence in Kohat; the total of cholera deaths registered in this month was 2859. In September the activity of the disease was maintained, but not increased, although in no less than eight districts their highest mortality was registered in this month; the total of deaths in September was 2424. In October there took place a decided and general abatement everywhere, except in Peshawur, where cholera attained its maximum intensity in this month; the mortality in October fell to 660 deaths registered. In November, excluding Peshawur, only 6 out of 31 districts returned cholera, and the number of deaths between them was only 16. In December the subsidence of the epidemic cholera of 1872 was complete; only two deaths, both in the Jullundur district, were registered in this month throughout the province. In the south-eastern districts, from the Umballa to Delhi divisions, the disease had subsided by the beginning of October, having commenced epidemic activity in April. In the districts of the Jullundur division the disease showed signs of commencing activity as early as February and March, but in them the period of maximum fatality was not attained till August and September, and the disease lingered on till December in the Jullundur district. In the districts westward from Amritsar inclusive to the Indus the disease did not begin to become generally active until June, and then in only the districts along the base of the hills, the southern districts in this area remaining free of the disease, more or less completely, all through the year; in these it became epidemic in July, and in August and September prevailed with maximum severity, declining in October, and ceasing entirely in November. The figures for Peshawur show that the disease broke out there in October, ran a rapid epidemic course, and subsided completely by the end of November. For the province as a whole, the epidemic cholera of 1872 may be said to have commenced in April and terminated in October.

The death returns for April indicate that the disease commenced its epidemic course with two local outbreaks—one in Karnal, the other in the adjoining Umballa district.

The following particulars regarding the cholera of 1872 in this province are derived from the "Sanitary Report for the Punjab" for that year:—

Regarding the outbreak in the Karnal district, it is recorded that a number of people had gone from the small town of Ahon to attend a fair held at Pihowa, in the southern part of the Umballa district, on the 6th April and subsequent days, and at which from 20,000 to 30,000 people were assembled, chiefly from the surrounding districts. Among the Ahon people who attended the fair were two women, "who were apparently in good health when they started on the 6th April, and also on their return on the 8th; but on the 10th one of them was seized with all the symptoms of Asiatic cholera. The other was taken ill in the same way on the 11th April, and they both died on that day. A man who lived within the same enclosure as one of these women was soon afterwards seized; then another man of the same caste, whose house was only a few paces from his; and the disease then spread to the rest of the village." On inquiry it was also discovered "that another woman, whose death had not been reported, had gone from the village of Shamli to the Pihowa fair on the 7th April, that she also had been seized with cholera while on her way back on the 10th, and died on the 12th, two days after reaching home. As in the case of Ahon, the disease here likewise spread to the other inhabitants." Nothing is recorded of the presence of any cholera at the fair itself or at Pihowa; but it is stated, in reference to the cases above mentioned, that the disease "immediately after-

wards began to spread in the villages around Pihowa." Regarding the course taken by the disease it is stated—"From this centre it rapidly spread through the surrounding villages (a larger proportion of which were affected than in any other part), and taking its way in a south-westerly direction through Karnal and part of the Patiala territory, it reached Hissar, from which it spread to Sirsa, and ultimately to the southern portion of the Ferozepore district."

Some bands of pilgrims attending the annual fair in April at Hardwar also suffered from cholera. Regarding these, it is stated that the pilgrims from Jammu, in Kashmir territory, began to arrive at Hardwar on the 9th April, and went to their usual encamping-ground on the Rori Island, opposite the town of Hardwar. They had marched fast, as they did the whole distance on foot in fourteen days. On the day of their arrival one of their number was brought to hospital with purging of four days' duration; stools bilious. There had been no vomiting. On the 10th April a man, aged 25, from Nadore, was admitted. He had marched the whole distance on foot in fifteen days, and arrived about mid-day on the 10th, very tired, but, as he said, in his usual health. He at once ate a quantity of coarse sugar, and soon after vomited, and was twice purged; stools white; no vomiting or purging after 3 P.M. "On admission his eyes were sunk; great tormina; no cramp; great thirst; pulse small and weak." He recovered. On the 11th April another case was admitted—a man, aged 20, who had arrived the previous evening from Kangra, in his usual health. After eating a quantity of coarse sugar (*gúr*), as in the last case, he was purged, the stools being yellow, and vomited. He was admitted to hospital in "a state of marked collapse," and died in the evening. The other pilgrims had moved off immediately after bathing. "On the morning of the 13th April the dead body of a Jammu pilgrim was found on the Saharanpur encamping-ground (38 miles from Hardwar), with his companion ill with vomiting and purging; he also died from secondary fever after cholera." The other pilgrims had made off, leaving these cases behind, and crossed the Jumna as rapidly as possible. Their course through the Punjab towards their homes was traced, and it was found that one of their party died of cholera in the Jagadhri dispensary, the first stage from Saharanpur, on the 14th April; another on the 15th at Bilaspur, the next stage; at Sadhaura another, and at Manimajra one more, on the 19th; on the 20th one died at Naraingarh, and on the 22d one in the Rupar dispensary. At Rupar a resident of the town had died of cholera on the 17th, and is said to have had no communication with the pilgrims passing through. Here crossing the Sultaj, the pilgrims entered the Hoshiarpur district; and the following is a list of the seizures which occurred among them in their passage through that district, as "supplied by the civil surgeon of Hoshiarpur, who had personally seen all the cases," viz., 1 seizure at Balachor on 17th April; 1 at Samandra on the same day; 3 at Balachor on the 18th; 1 at Majari on the 19th; 1 at Hoshiarpur city on the 22d; 2 at Garshankar—one each day on the 22d and 23d; and again 1 at Majari on the 24th. Of these 10 pilgrims 4 died in the Garshankar dispensary. "There is no intelligence of any deaths or seizures among the pilgrims in their passage through Gurdaspur and Sialkot; but within a short time after their arrival in the Jammu territory cholera made its appearance there." They had evidently outstripped the advance of the cholera; for, "from information afforded by the Kashmir Government, it would appear that about 2000 pilgrims had gone to Hardwar this year, that the first returning bands began to arrive in the country on the 20th April, and that the first case of

cholera occurred on the 5th May in a town in the Kheri division, which is the part of Jammu which lies nearest to Sialkot. On the 13th May the disease appeared in the town of Jammu. Here it attacked the Maharaja's troops, who were moved on account of it across the river to Akhnúr; shortly afterwards it broke out in that town. It was reported to have reached Shapayon in June, and to have been prevalent in Srinagar before the 5th July; after which it spread throughout Kashmir, causing great mortality."

No further outbreaks of cholera occurred during April and May in the track of the pilgrims through the districts of Gurdaspur and Sialkot, though later on, as in Hoshiarpur, cholera became epidemic in both these districts. On the 24th April, however, a fatal case of cholera occurred in Sialkot among the European troops stationed there. It is stated as a distinguishing feature in the progress of this epidemic "that it did not march steadily up country along the main lines of the traffic."

From a statement prepared showing the daily deaths from cholera in each town and village in the Punjab, it appears that there is "no ground for the belief that a large number of villages distributed over wide tracts of country are struck with the epidemic in a single night. The isolated cases which happened early in the season at such remote points as Sialkot, Abbottabad, and Mardan might be taken as evidence that the whole province was thus early occupied by a so-called 'aura' of the disease."

The history of these cases will be found further on.

The statement of daily deaths above referred to shows that in large towns the mortality from cholera does not reach "its maximum at once, as if struck by a passing blast," but that it is gradual in its rise and fall. The statement shows, it is said, that in large towns—

"At first there were dropping cases, continuing sometimes for weeks, as in the case of Lahore, before the disease was able to make any headway. Gradually it reaches its maximum, and gradually, though more rapidly, it declines. . . . Another point which the daily statement makes clear is the comparative rarity with which the disease, even when imported into a place, finds the peculiar circumstances favourable to its spread. This is shown by a large number of towns in which only one death occurs, amounting to nearly a half of all the towns and villages in which deaths were recorded; and if there are so many instances in which only one *death* took place in a town, in how many more must it have happened that a *non-fatal case* of the disease occurred without being followed by any outbreaks?"

In a large number of instances it was observed that—

"The first case of cholera in towns and districts was a traveller from previously affected parts."

Regarding the smallness of the affected tract of the province compared with the enormous area unaffected, it is stated that—

Excluding the southern districts of the province, from Ludhiana upwards, the disease may be said to have "confined itself almost entirely to the comparatively narrow tract of country lying between the Grand Trunk Road and Himalayas"—at first at least, for subsequently the main force of the disease was manifested along the course of the Grand Trunk Road, "along which every large town from Ludhiana to Peshawur, with the exception of Amritsar and Gujrat, suffered to a greater or less extent. The towns within a few miles of the left of the Grand Trunk Road also suffered in some degree; but beyond that the disease may be said to have been unknown in the vast tract of country comprised within the districts of Montgomery, Mooltan, the Native State of Bahawalpur (where not a single case occurred), Jhang, Muzaffargarh, Dera Ghazi Khan, Dera Ismail Khan, Bannu, the greater part of Rawal Pindi and Jhelum, Shahpur (with the exception of a small portion on the banks of the Jhelum), and the south-western half of Gujrat, Gujranwala, and Lahore. The only exception to the rule, that the disease did not appear to any extent on the left or western side of the Grand Trunk Road, was Kohat."

There is a marked difference between the physical aspects and climates of these two areas. The affected area abounds in populous towns and villages, is traversed in all directions by numerous routes of communication, is highly cultivated and fairly well wooded, and freely watered by streams and canals, and has a more abundant rainfall, and is more directly under the influence of the south-west monsoon rains—here the south-east monsoon. The exempted area, on the other hand, is sparsely populated, with few large towns, and its villages widely scattered; presents wide tracts of arid desert or waste lands, is scantily cultivated, bare of trees, and very poorly watered; has few routes of communication, and is beyond the influence of the rain-bringing monsoon; it is a region which has always, so far as our knowledge extends, manifested a marked general immunity from the activity of cholera.

Regarding quarantine in 1872, it is recorded that "this measure was adopted to a considerable extent where it was thought suitable;" and the freedom of Umballa cantonment, situated in the midst of the most generally affected district in the province, and of Sanawar Military Asylum, in close proximity to Kasauli, Dagshai, and Subathu, where cholera prevailed severely, are cited as proofs of its efficacy. On the other hand, the Peshawur district and the military cantonments of Jullundur and Mian Mir are mentioned as instances in which the measure failed to keep out the disease, although the "quarantine was established in a good time, and kept up as strictly as possibly can be." At the same time, "the large town of Amritsar, having daily communication with Lahore and Mian Mir, where cholera prevailed for months, escaped with only a few cases of the disease, although there was no quarantine or any special measures taken for its protection."

With this general account of the epidemic as it affected the province as a whole, I proceed to note some of the details recorded as to how it affected each district separately. Two points are worthy of attention—

First, the frequency with which mention is made of instances where attendants on the sick and sweepers were attacked with the disease; and second, the number of times it happened that medical officers were mistaken as to the true nature of the disease when it first appeared in a place. "And there is no doubt that in epidemic seasons the proper thing to do is to look on all cases of severe diarrhœa as really cholera, and to treat them accordingly," writes Dr. De Renzy.

Gurgaon.—Total cholera deaths registered 162, in 37 villages altogether. Of this number 14 villages registered only a single death each, and in only 11 were 5 or more cholera deaths registered.

Delhi.—Total deaths 219. Of this number only 3 occurred in the city of Delhi, 1 each in the months of April, August, and September, the 2 first being travellers arrived by railway. In the district only 28 places recorded cholera, 11 returning an aggregate of 193 deaths, and 17 an aggregate of 22 only.

Rohtak.—Only 10 cases of cholera were recorded in this district, of which 3 died. They all occurred in the village of Sampla, situated close to a village in the Delhi district in which cholera prevailed.

Hissar.—Total deaths 74, of which 40 were in 4 towns and 33 in 24 villages.

Sirsa.—Total deaths 99, viz., 49 from 4 places, and 50 from 24 other places.

Karnal.—Total deaths 1089, viz., 212 from 16 places in Karnal subdivision, 714 from 36 places in Kaithal subdivision, 18 from Panipat town, and 145 from 85 other places in the district. In the Panipat subdivision, which is the most southerly, only 6 villages recorded cholera, and together

they returned 26 deaths. As has been before mentioned, the epidemic cholera of the year commenced in the Ahon and Shamli villages in this district. In Ahon there were 17 deaths, the first on 11th April; in Shamli 23, the first on 24th April. In Karnal town, population 29,007, there were 61 deaths, the first on the 25th April. The epidemic was more fatal in this district than in any other, except Kohat, at the opposite extremity of the province. The villages first affected were mainly clustered within a circuit of about 20 miles from the locality of the Pihowa fair. Of the three subdivisions of the district, Kaithal, which borders on Pihowa, suffered most severely; out of the 138 places recording cholera 92 were in Kaithal subdivision; and together they registered 812 deaths. Regarding the disease in the town of Karnal it is stated—

"A death occurred on the 25th April. Afterwards a traveller died in the town on 2d May. On 10th May a man from the neighbourhood of Pihowa died. On the 12th 5 cases were reported in the city, but they were supposed to be bilious remittent fever, and they all recovered. Two more travellers died on the 16th and 17th May. On the 19th two people of the town were attacked. On 9th June another traveller from near Pihowa died. All these cases were carefully isolated, and no more occurred till 23d July, when the disease broke out among the leather-dressers of the town. From that time up to the end of August 58 deaths were registered from the disease, and it then disappeared."

Umballa.—Total deaths 1121, in altogether 166 towns and villages, of which 60 returned 5 or more deaths each, and 106 less than 5 deaths each Apart from the 2 deaths registered in January and February, the first death of the epidemic was registered on the 14th April in the town of Jagadhri, population 11,676. No other cholera death was registered in Jagadhri until August, in which month 1 was registered, and 3 more in September; total, 5 deaths. In Pihowa, population 3675, where the fair was held, 7 cholera deaths were registered in April, the first on the 23d; and 1 was registered in May; total, 8 deaths. The town of Rupar, population 8700, registered its first cholera death on 17th April, and returned a total of 75 deaths from the disease, viz., 2 in April, 3 in May, 1 in June, 61 in August, and 8 in September. The town of Sadhaura, population 11,198, registered its first cholera death on the 19th April, and returned altogether 11 deaths from the disease, viz., 2 in April, 3 in May, 2 in August, and 4 in September. The town of Umballa, population 24,040, for a long time escaped. "Again and again cases were imported into it from without, but it was not till August that the disease can be said to have assumed an epidemic form in the city, and the total deaths recorded in it were only 97, or 4 per 1000." In Umballa the relation between rainfall and cholera mortality is illustrated by the following statement:—

	May.	June.	July.	August.	September.
Rainfall . . .	0·5	8·1	18·8	15·2	4·9
Cholera deaths . .	1	4	7	70	15

Simla.—The first case of cholera in this district was reported on 28th April at Kasauli, in a lad who had that day arrived there from Jullundur by way of Rupar and Manimajra; he recovered. On the 5th May cholera was reported to have appeared in the small hill-state of Kothar, 4 miles from Subathu, but nothing more was heard of it there. On the 5th July the disease broke out among the European troops at Kasauli, on the 11th July it appeared at Subathu, on the 18th July in Simla, and in Dagshai not till the 29th July. In the Lawrence Military Asylum, a mile from Kasauli, and containing 426 children of European soldiers, besides a large staff of

teachers and others, the disease did not appear till the 9th August. Excluding these hill sanitaria, only 5 cholera deaths were registered in the Simla district, and these occurred not far from Subathu. The independent hill-states in the neighbourhood of Simla furnished no mortality returns; but cholera was known to be widely diffused through the hills in this quarter.

Ludhiana.—Total deaths 717, of which 3 occurred in the first three months of the year. The first death registered after these was on 1st June at Janját Singh, and the next on 14th June at Sohawi, on the eastern border of the district. Altogether 65 places recorded cholera; of these 24 returning 5 or more deaths each registered a total of 641, and 41 returning less than 5 deaths each a total of 73. The places which suffered most were the towns of Ludhiana and Jagraon. In the former 266 deaths were registered, viz., 1 in July, 238 in August, and 27 in September; in the latter 110, viz., 2, 99, and 9 in the same months respectively.

Ferozepore.—Total deaths 322, in 17 places, of which 9 returning 5 or more deaths registered 311, and 8 returning less than 5 registered 11. The chief mortality took place in Mithraj, population 1081, where 174 deaths were registered, or at the rate of 160.96 per mille. The town and military cantonment of Ferozepore remained exempt throughout.

Jullundur.—Total deaths 409, of which 4 were in the months of March (2), April (1), and May (1). Apart from these, the first case was that of a European traveller by railway from Delhi, who was taken out of the train at Jullundur city on the 9th May suffering from cholera; he recovered. He stated that he had halted nowhere by the way, that he had eaten some sweetmeat offered to him by a native with whom he was travelling, and that he was seized with vomiting and purging a few hours afterwards. The next case reported was that of a man who was seized with cholera on the 19th June; he had gone from his village, only about a mile and a half from Jullundur city, to a town in Hoshiarpur district, where cholera was then present, contracted the disease, and was brought back to his own village; he recovered. On the 21st June, or two days after his return, a boy living in the adjoining house, the well of which was common to both, was seized with cholera, and died. On the next three days five more cases occurred, of whom four died. All the cases lived in the same corner of the village as the man who first brought the disease. None of them were more than fifty paces from his house; some of them used the same well, which was partly inside his house, and open to pollution; some had been to see him or the others when ill of the disease, and all were of the same caste. Measures for isolating the sick were rigidly carried out, the well was closed, and the disease spread no further.

Similar accounts are recorded of the first appearance of the disease in some other places in this district. In Jullundur city 212 cases and 137 deaths were reported, the 1st on 17th August, the last on 22d September. One of the severest outbreaks in this district occurred in the village of Raipur, 5 or 6 miles from Jullundur, when the disease was subsiding elsewhere. Inquiry elicited that—

"A man, who was watching his cornfield during the night, was found in the morning lying insensible and dying at the mouth of a well close by; his clothes showed that he had both vomited and purged, and it was stated that it had rained heavily during the night. The ground sloped towards the mouth of the well, and there was nothing to prevent the rain washing into it. It was further ascertained that, although there were three or four other wells around the village, this was the best, and was therefore universally used by the people. In the course of nine days 60 cases and 33 deaths had occurred,

and 3 more cases, which proved fatal, took place within the next week, making in all 63 cases and 36 deaths in the course of sixteen days in a village of only 1330 inhabitants."

Hoshiarpur.—Total deaths 724, of which 4 occurred in February (1) and March (3). During the epidemic from April to October 717 deaths were registered, of which 639 occurred in 21 places returning 5 or more deaths each, and 78 in 42 places returning less than 5 deaths each. The cholera cases occurring among the Jammu pilgrims returning to their homes from Hardwar through this district in April have been mentioned in an earlier passage; the activity of the disease at that time lasted from the 17th April to the 2d June, during which period there were 70 seizures and 41 deaths recorded. There was then a lull, but towards the end of June the disease again broke out, and soon prevailed generally in the district. In Hoshiarpur itself the disease first appeared in the Khanpur suburb, about 1½ mile from the city, and was at first entirely confined to sweepers. After a few days the disease ceased in Khanpur and appeared in the city itself, where also at first it was entirely confined to sweepers and to one quarter of the town. Subsiding in the city, the disease reappeared in Khanpur, and this time confined itself to no particular caste or quarter. On its having again almost disappeared from Khanpur, it broke out for the second time in Hoshiarpur, and spread generally over the city. In the city, population 12,964, there were 200 deaths, and in the suburbs, population 7826, there were 138 registered from cholera from June to October. The mortality of this town, with its suburbs, was greater than that of any other of the large towns in the province throughout this epidemic, being at the rate of 16.25 per 1000. The relation between the rainfall and cholera mortality is shown as follows:—

	June.	July.	August.	September.
Rainfall	1·1	14·0	11·8	8·4
Cholera deaths . .	14	8	212	104

Kangra.—Total deaths 174, of which there occurred 4 in February and 1 in March before the commencement, and 5 in November after the termination of the epidemic. During the epidemic 25 places recorded cholera; of these only 3 returned 5 or more deaths each, total 133, and 22 returned a total of 31 deaths. Most of the mortality, 123 deaths, occurred in the one town of Nurpur, population 9928, or at the rate of 12.89 per 1000. The disease here began on the 17th August, and lasted all through September and October. The town occupies the summit and slopes of an elevated ridge of porous sandstone rock. The rest of the district recorded very little cholera this year, though "deaths from bowel-complaints are of very common occurrence in this district; and even in ordinary years, when there is no reason to believe that cholera exists anywhere in the Punjab, deaths from this cause are being constantly reported from it."

Gurdaspur.—Total deaths 863, of which 4 were in January, 6 in February, and 1 in March. The remaining 852 were registered from May to October inclusive, viz., 778 in 39 places returning 5 or more deaths each, and 74 in 41 other places. No cholera death was reported in April, the month in which the district was traversed by the pilgrims returning from Hardwar. In May a simultaneous outbreak of cholera occurred in three villages (Pandori, Talabpura, and Jamwal) situated on or close to the pilgrim route, and 14 deaths occurred in the three during the first nine days of May. After this the disease spread all over the district, and caused a mortality which was only exceeded in the death-rate by four others in the province. The disease

was most prevalent in the tract at the foot of the hills. In the Batala subdivision, furthest from the hills, only 4 places, including Batala town, recorded cholera, and registered altogether 120 deaths, of which 102 occurred in Batala, population 27,280, the largest town in the district. The epidemic in this district did not reach its maximum intensity till September, during which month more than half of the total of registered deaths occurred.

Amritsar.—Total deaths 94, of which 3 were in January, 1 in February, and 1 in March. The remainder were registered from June to September inclusive in 36 places, of which 3 together returned 46 deaths, and 39 others 41 in all. The largest number of deaths in any one place occurred in the town of Fatehabad, population 3486, where 34 were registered, viz., 28 in August and 6 in September. The city of Amritsar, population 131,771, returned only 7 deaths, viz., 1 in July and 6 in August. The remarkable immunity of this populous and crowded city, 32 miles by railway from Lahore, where cholera was prevalent for $3\frac{1}{2}$ months, is very noteworthy, particularly as no special precautions were taken to prevent the importation of the disease. The jail and garrison in the fort entirely escaped the disease. This district, which suffered so severely in 1869, thus escaped almost scatheless in 1872. The relation of the rainfall to the cholera mortality in both years is shown month by month in the subjoined statement for the purpose of comparison :—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1869.	Rainfall	1·90	0	3·80	0	0	4·40	7·60	0·20	2·20	1·50	0	0	21·60
	Cholera	5	6	6	8	21	44	613	2,653	224	23	4	1	3,608
1872.	Rainfall	0·90	0·90	0·50	0·70	1·30	1·70	9·40	7·10	5·40	0	0	0·40	28·30
	Cholera	1	1	1	0	0	3	5	44	39	0	0	0	94

Add to this that the year 1869 was one of famine and 1872 one of cheap food, and we can understand, under the views I have so often propounded and illustrated by examples in the preceding pages, how it happened that Amritsar escaped epidemic cholera in 1872 whilst it suffered severely from epidemic cholera in 1869. A glance at the above statement will show that the epidemic cholera of 1869 commenced in June with copious rain after two months of drought, whilst it was preceded by sensible activity of the disease following upon abundant rainfall in March in succession to drought in February. In July, owing to continuance of heavy rainfall, the epidemic which commenced its activity in the preceding month made comparatively slow progress; but in August, with next to no rainfall and a hot sun playing upon a well-moistened soil, it bounded forward with great strides in response to the very active evaporation then going on. Again in September, with an abundant rainfall and declining temperature, the evaporation so active in the preceding month received a check, and with this cholera too abated its activity. Now, in 1872 we find no such alternations of drought and rainfall, and consequently no periods of abnormal activity of evaporation of moisture from the surface of the soil; and with the absence of this abnormal activity of evaporation we find also an absence of abnormal epidemic cholera activity.

Instances similar to the above may be found in the recorded statistics of our series of years by the score, not only in this but in the other provinces of India also, and I might fill volumes with illustrations in point from them.

Lahore.—Total deaths 629, of which there were 1 in January, 2 in February, and 1 in March, and the remainder from May to November inclusive. Altogether 60 places recorded cholera, of which 8, returning 5 or more deaths each, registered a total of 548, and 52 others registered altogether 77 deaths. The first known case of cholera in May in this district occurred on the 12th of that month, in the lunatic asylum, when a "very sickly idiotic woman, who had been in the asylum for two years, and had not been out of it, was seized, and died in fourteen hours." No cholera had been registered in the district since the preceding March, and none had shown itself on the line of railway nearer than Jullundur, where a European passenger was taken out of the train on the 9th May suffering of the disease. No other case occurred in the asylum till the 23d May, when a second woman was seized with choleraic diarrhœa; she recovered, but on the 25th a third was taken ill and died. On the 26th May cholera appeared in an enclosed garden at a distance of 790 feet to the northward of the female ward of the asylum, the male ward intervening.

Here lived a Eurasian, formerly deputy superintendent of the asylum, and who had left it a month and a half before the first appearance of cholera there. On the date mentioned two of his children were seized with cholera at the same moment, and died within a few minutes of each other, after seven hours' illness. In the afternoon of the same day a third child was taken ill, and died next morning; while about this time also a fourth fell sick, but ultimately recovered. On the 28th a Native servant of the family, who had been attending on them while sick, was attacked. The illness of these children was attributed to some melons they had eaten the day before—"a cause," Dr. Scriven adds, "to which cholera is often ascribed, and not altogether without reason, as they are generally grown in fresh human manure, and are sometimes brought into the city to be sold in the very carts that have carried out the nightsoil."

It is recorded that on the same day that the outbreak occurred in this garden two cases of cholera occurred in one house in a very dirty part in the heart of the city. One of these cases was taken to a distant part of the city on the 27th May, and on the 1st June a man in a house immediately opposite fell sick. Nine other cases shortly followed in the immediate neighbourhood, and on the 31st May and following day cases of choleraic diarrhœa were heard of in other parts of the city. The neighbourhood of the railway station, where a large number of the employés reside, although in the immediate vicinity of the lunatic asylum, remained free from the disease till the 13th June, when a Native workman died of it, and another who lived in the same house died on the 15th. The first case among the European employés was on the 6th July, and others occurred on the 7th, 11th, 12th, 14th, 25th, August 1st, 6th, 7th, and 27th. There were 10 cases in all, of whom 6 died; and besides these there were other cases of doubtful diarrhœa. The first case among Europeans in the civil station was on the 20th July; of these 21 were attacked (2 in Donald Town and 19 in Anarkali), but only 5 of the number proved fatal. On the 19th July the disease was first heard of beyond Lahore and its suburbs; first in two villages close to each other, and about 3 miles from Lahore; afterwards it visited successively twenty other villages, all of them within a few miles of Lahore. Comparatively little mortality occurred in the more distant villages.

On the 14th August the disease appeared in the central jail, although the "utmost precautions were taken to exclude the disease by stopping all

communication from the city and the affected suburbs which lay in its immediate vicinity."

The first case was a sweeper who had been six years in jail, and had not been outside. On the 15th a second case occurred in one of the hospital wards furthest away from the building set apart for cholera cases. On the 16th 3 cases occurred in different parts of the jail. From the 18th to the 23d August 2035 prisoners were moved into camp about a mile from the jail, up to which date 44 cases of cholera had occurred among them; after that only 3 more cases occurred, all among the few prisoners who were left behind in the jail, one of these being from a gang employed in cleaning out the jail, and the other two in hospital. The last case occurred on the 27th August. Altogether there were 47 cases and 22 deaths. In the paid establishment no case occurred, but one of the police guard was seized on the 24th.

Regarding the outbreak in the lunatic asylum, it is recorded that at the commencement of the outbreak there the number of lunatics was 273, of which 39 were attacked and 25 died between the 12th May and 6th August, the bulk of the cases occurring in June.

Among the attendants 5 were seized, viz., a sweeper, a guard in the dangerous ward, and 3 warders; by the 14th June cases had occurred in every part of the asylum which was regularly inhabited by lunatics, except the dangerous ward, the inmates of which were kept separate from the rest. On the 16th June a guard on duty there was first seized, then 4 of the lunatics were attacked on the 17th, and another on the 18th. The women, 56 in number, were first moved out of the asylum on the 8th June, and no other cases occurred among them until the 28th July, when they were attacked afresh in their new abode. From the latter date up to the 6th August 3 were attacked; they were moved back into the asylum on the 8th, and remained perfectly free from the disease afterwards. The harmless males, 149 in number, were moved out to a spot near the women on the 15th June and the following day; 5 cases had occurred among them, and 7 more fell ill up to the 19th July; they were all mild cases of choleraic diarrhœa, except one who died. After a lull of twelve days a fresh outbreak occurred on the 31st July, corresponding to that among the women on the 28th July, and 3 men were carried off by the 5th August. From this date no more cases occurred among the male lunatics, and they were moved back into the asylum on the 13th September. The dangerous lunatics, fifty in number, were moved out of the asylum on the 20th June, after which they remained free from the disease for five days; but on the 25th a warder in attendance fell ill and died; on the 26th two more warders and a lunatic were attacked; on the 27th two more cases among the lunatics occurred; and on the 28th they were moved back into their own ward in the asylum, which during their absence had been thoroughly scraped, cleaned, and disinfected. From that date not another case occurred among them.

In the city of Lahore the disease made little progress till the middle of July, when it began to increase; it attained its height from 12th to 21st August, the very time that the disease reached its maximum in the two preceding epidemics of 1862 and 1867, the daily average admissions during these days being 18.5; it then rapidly declined, and the last case recorded was on the 13th September. The total deaths registered in the city of Lahore, population 85,346, amounted to 298, and in its suburbs, population 9831, to 147, total 445, or at the rate of 3.49 per mille of the total population. As sanitary measures, "every Native house in which a case of cholera occurred was fumigated with sulphur, the walls whitewashed, and 6 inches of earth removed from the floor and replaced with fresh earth; quilts used for bedding and the cots on which the sick lay were burnt (compensation being paid at once on application to the police), while their clothes were boiled for a quarter of an hour."

Montgomery.—Total deaths 5 only. The first case, on the 3d August, was a child of an engine-driver on the railway, who was taken ill in the train coming from Lahore, and died shortly after arrival at Montgomery station.

Mooltan.—No cholera was reported in this district. At Mooltan itself

a few cases occurred among the troops about the middle of August; and a fatal case occurred in the quarantine camp on the 24th August in the person of an old woman who had arrived on the 22d from Sialkot. This was the only death registered among the civil population in this district.

Muzaffargarh.—Only 3 deaths were registered in this district, 1 in May and 2 in August. Of the latter, one was a Native soldier returning to his regiment at Dera Ghazi Khan from furlough. He arrived at Muzaffargarh from Mooltan on the 22d August, and died in the dispensary there on the 25th; the other was the sweeper of the dispensary, who was in constant attendance on him, and who also died.

Jhang.—Only one cholera death was registered in this district in February.

Gujranwala.—Total deaths 352, of which 1 occurred in January, 1 in February, 7 in June, and the rest in August, September, and October. During the epidemic 19 places were affected, of which 8, returning 5 or more deaths each, registered altogether 327 deaths, and 11 others together 23. The town of Gujranwala, population 19,381, registered 154 deaths, and the town of Wazirabad, population 15,653, registered 121. The greatest portion of the mortality occurred between the 15th August and 15th September, during the general activity of cholera everywhere in the affected parts of the province. "In several instances the first cases of cholera in towns were found to have happened in people who had run away in alarm from other towns, such as Lahore, Gujranwala, where the disease was raging."

Sialkot.—Total deaths 283, of which 1 was in January, and all the rest between June and October. Altogether 50 places recorded cholera, of which 17, returning 5 or more deaths each, registered together 227 deaths, and 33 others 55 deaths. The first case of cholera recorded in this district after that in January occurred on the 24th April in a man of the Royal Irish Lancers, stationed at Sialkot; he died on that date. On the 20th May a woman and a child of different families, living in the same block of buildings in the lines of the Native troops, were attacked with cholera and died. On the 25th May two soldiers of H.M.'s 58th Regiment were taken ill; "one of these had been suffering from diarrhœa for three days, and the other was intoxicated the night before admission; and a third soldier, who was attending in hospital, was taken ill within the next two days; and all three died." Other cases were reported from some villages towards the Jammu border during June and July; and from this time the disease is described as "flitting about the district, carrying off two or three at a time, and then disappearing to reappear elsewhere." It is stated that quarantine was established to protect the cantonments and city—

"But after a long time, on 17th August, 3 fatal cases of cholera occurred in a village 2 miles south-west from the city, and on the 19th a sharp outbreak occurred at Chitti, about 3 miles west of the station, and on the 26th the disease broke out in the suburbs of the city."

In the city the disease continued till the end of September; there were 64 seizures and 36 deaths altogether. With the exception of an officer of the 5th Royal Irish Lancers, who was seized at this time, but recovered, no more cases occurred among the troops in cantonments.

Gujrat.—Total deaths 68, of which 1 occurred in January, 1 in February, 1 in March, and 1 in May, and the rest in July (2), August, and September. The history of the cholera of 1872 in this district is interesting. The district lies between the rivers Jhelum and Chenab, has on the west the district

of Jhelum, on the south the districts of Shahpur and Gujranwala, on the east the district of Sialkot, and on the north the Jammu division of Kashmir territory; and it is traversed, almost through the centre of the district, by the Grand Trunk Road from Delhi to Peshawur. One of the main routes for travellers to and from Kashmir also diverges from it at the town of Gujrat. After the first four months no cholera death was registered in this district until July, although the disease was rife in Jammu and Akhnur in April and May, had appeared in Jhelum in June, in Gujranwala in the same month, and in Sialkot as early as April. The first case of the epidemic cholera of the year in this district appeared in the village of Fateh Musa, 10 miles eastward from Gujrat town, on the road to Sialkot.

"A Muhammadan priest, who had returned from a visit to Lahore on the 3d August was taken ill on his arrival, and died on the 6th. By the 7th 10 persons were attacked, most of whom were friends who had assembled at his house to welcome him home, and who afterwards took part in attendance upon him during his three days' illness. By the 16th August 24 cases and 10 deaths had occurred."

Dropping cases then began to appear all over the district, and in 16 out of 21 cases reported the sufferers were travellers, or residents who had returned from visits to affected places. In the town of Kunjah, 8 miles west from Gujrat, a short but virulent outbreak occurred towards the latter part of August.

A Native merchant, who had been to Jammu on business, "returned on the morning of the 24th August, was seized the next day, and died on the 26th. Within the next five days 12 people of the same ward of the town were seized, of whom only 2 recovered."

On the 26th August another severe outbreak occurred in the village of Khalás, population 410, situated about 7 miles west from Bhimbar, in Kashmir territory.

On that date a coolie, who had returned from his employment on the railway works near Jhelum to visit his family, was seized, and died there on the 27th. On the night of the 27th 8 others, who, it is stated, had eaten and smoked with him the previous evening, although not actually of his own household, were seized, and of them only 3 recovered. In the next four days 24 others were taken ill, of whom 16 recovered.

The three places Fateh Musa, Kunja, and Khalás were the only villages where cholera broke out in epidemic form in this district. In the town of Gujrat only 4 cases were treated. The first was the son of a railway employé travelling through from Jhelum, and he died on the 10th August; the second was a Hindu of the town, who had returned from the direction of Wazirabad, and who the following evening, after joining in a wedding feast, was taken ill, and died in a few hours. The third was a police constable, who was admitted into hospital on the morning of his return from Jhelum, where he had gone on escort duty, and he recovered. The fourth was a traveller, found lying on the Grand Trunk Road in the last stage of the disease, and who only survived his removal to hospital two or three hours. A fifth case also occurred in an American gentleman, who had caught the disease on his way from Kashmir.

"He had rallied in a measure by the time he reached Gujrat, on the 10th August, notwithstanding fatigue, exposure, and want of medical treatment; but as he insisted on pushing on to catch some steamer at Calcutta, his strength failed by the way, and he died on reaching Lahore."

When cholera reached Wazirabad it was deemed prudent for the protection of the very large European community, as well as the immense establishment of Native workmen employed on the railway bridge works at

Kothala, on the opposite bank of the Chenab, to remove the ferry half a mile further down the river, and so to divert the stream of travellers constantly passing up and down the Grand Trunk Road. Cholera did not show itself among the people employed here.

Shahpur.—Total deaths 43, all in August and September, and all in a small part of the district on the bank of the Jhelum River. In Miani, population 6857, cholera broke out about the middle of August; there were 11 cases and 3 deaths. About the 24th August cholera broke out in two villages a few miles from Miani, and caused 24 deaths.

Jhelum.—Total deaths 281, all from May to September. Of these 238 were in 5 places returning 5 or more deaths each, and 43 in 31 other places. Of the 2 deaths registered in May, 1 occurred on the Grand Trunk Road; the other was a traveller from Jhang; no cholera was known to exist at Jhang at that time or afterwards. Four other isolated deaths occurred afterwards in the Pindadan Khan circle. The first place where the disease appeared epidemically was Jhelum town, population 5148, where 54 deaths were registered; the first case was on the 10th July, and the disease at first was confined to one part of the town, but soon spread irregularly in and around it. The first case among the troops occurred on the 24th July; altogether 9 cases occurred in cantonments, where, the civil surgeon mentions, "suspicious diarrhœa was universally prevalent at this time." In Pindadan Khan, population 17,538, altogether 163 cholera deaths were registered, of which 2 were in June, 1 in July, 159 in August, and 1 in September. The disease broke out in a quarter of the town inhabited by sweepers in the end of July, and spread to the rest of the town. Only about a fourth of the cases reported proved fatal. It is stated also that "about this time a very severe form of fever began to prevail in the towns on both banks of the Jhelum, and which had many symptoms scarcely distinguishable from cholera." The cholera mortality of Pindadan Khan was 10.01 per mille of population, one of the highest rates for towns in the province.

Rawal Pindi.—Total deaths 148, from June to October. The first notice of cholera in this district was on the 10th June, in a mother and child, who were taken ill in a village about 1½ mile from Gujarkhan, on the Grand Trunk Road. On the 17th June 6 suspicious cases of vomiting and purging were reported from Hasan Abdal, also on the Grand Trunk Road, of which 1 proved fatal in twenty-four hours. The next case was on the 17th July, at Rawal Pindi, where a European soldier, employed on the traction engine there, was seized with cholera; and the same day a native gardener in cantonments was seized, and died in two hours. On the 18th July a case was admitted into the Gujarkhan dispensary, and on the 19th the civil surgeon saw 2 cases in a hut near the Grand Trunk Road, about 6 miles from Rawal Pindi. On the 21st August the first known case of cholera in the town of Rawal Pindi occurred.

"It was in a child with whose parents some visitors from Gujranwala had been staying. The second was in a child living in the adjoining house, who had been brought by his parents to the funeral ceremonies of the other. The third was a brother of the second, and had also been present at the ceremonies. These two occurred on the afternoon of the 21st, in the early morning of which the first case had died. The fourth case was a brother of the first; he was seized on the 22d, and died the same day; and the father, mother, and grandmother of the second and third cases were subsequently attacked on the 23d and 24th. On the 22d August a case also took place in a distant part of the town much frequented by travellers; and the same day another seizure took place in the cantonment cavalry lines."

The subsequent course of the disease was very erratic; it lasted from

the 21st August to the 14th September, the total deaths registered during that time being 42. Among the European troops in cantonments there were only 4 deaths from cholera, and 14 occurred among the Native population of the cantonment.

In Murree hill sanitarium cholera appeared on the 10th August among the European soldiers of the convalescent depot, "and the attack was said to be induced by an over-indulgence in fruit." On the 24th August a second case of cholera occurred in the station. "The subject of it was the female sweeper of a family in which a child had died of cholera on the 15th or 16th at Lahore, immediately before they started for Murree, and the woman was seized on the day after her arrival." On the 25th August a Kashmiri coolie was found lying near the commissariat bakery suffering from the disease, and the same day another Kashmiri employed in the bakery was taken ill. "This man slept in a room in the bakery along with a number of others employed there. He was taken ill during the night, but the nature of his disease was not recognised till the commissariat sergeant, on looking in the morning, saw the ground near where he was lying damp from his discharges. This room was at once evacuated and disinfected." On the 28th a baker in the bazar on the other side of the hill was seized, and on the 29th a second baker in the commissariat bakery itself was seized. On this date also a third Kashmiri coolie from the Kashmiri quarter, at some distance below the bakery, and two European soldiers, from the barracks situated at the top of the hill above the bakery, were seized. On the following day 9 more cases occurred among the European troops, and a commissariat mule-driver in the neighbourhood of the bakery was also seized. "After a lull of nearly three days among the civil population the disease showed itself in a different part of the station, and it then for a time was principally confined to the line of drainage which passes down from the Post Office towards the Rawal Pindi road." Cases of the disease then cropped up all over the station, but it was remarked by the civil surgeon that a very large proportion of the seizures was among the Kashmiris. In all 56 deaths were registered among the civil population of Murree, and several deaths among the coolies also occurred on the roads leading out of the station in different directions. It is recorded "that of the 5 admissions into the cholera hospital for natives from the European barracks no fewer than 4 were sweepers."

The disease, it is recorded, prevailed at Srinagar, in Kashmir, throughout the month of August, and in the territory contiguous to Murree on the left bank of the Jhelum. A quarantine was early established at Dewal, 10 miles from the station on the Kashmir road, and all necessary precautions were taken regarding the sale of unripe fruit, unwholesome food, &c. The disease was, it is stated, of remarkable malignity, the premonitory symptoms being of short duration, and collapse setting in shortly after the attack, the different remedies employed being of little efficacy.

"Nothing whatever," writes the medical officer of the depot, "occurred to support the theory of the propagation of the disease either by contagion or the use of contaminated water, numerous cases having occurred simultaneously in different parts of the station, the patients having had no communication with each other. None of the orderlies or fatigue men, who nursed their stricken comrades with the greatest devotion, were attacked, nor any one in attendance on the sick in any part of the station. The water used by those attacked was the same as that used by hundreds of healthy men, and was carefully filtered in every barrack." Two days before the outbreak of the disease, on the 29th August, a dense brown mist overhung the valley of the Jhelum, the atmosphere at Murree being extremely close and oppressive, while the wind blew, though not strongly, from the north-east, namely, from the affected localities.

Hazara.—Total deaths 68, of which there were 1 in February, 1 in April, and 1 in June, and the rest in September and October. Altogether 42 places recorded cholera, and in only 2 of them did the deaths reach 5 or more. The disease was principally confined to the Haripur subdivision.

Kohat.—Total deaths 351, all in August, September, and October. At the end of June or early in July several cases of a suspiciously choleraic character had occurred in the Kohat cantonment; but on the 12th August a Sepoy was attacked with choleraic symptoms, vomiting, cramps, and suppression of urine. On the 16th a man was admitted with diarrhœa, which subsequently, on the 20th, assumed a decided choleraic character; and on that date, 20th August, the first recognised case of cholera occurred in a camp-follower who had been resident four months in the cantonments.

On the afternoon of the 19th August there was a violent gale of wind, which was followed by heavy rain; trees were uprooted all over the station, and several houses unroofed.

On the 21st August there were altogether 11 cases in the cantonment, and the epidemic reached its climax between the 28th and 31st August. There were altogether 166 deaths recorded among the troops and camp-followers in Kohat cantonment, of which 97 occurred from 20th to 31st August, and 67 from 1st to 18th September, 1 more on the 23d, and the last on the 30th. It is stated "that of 51 attendants on cholera patients no less than 12 were attacked by the disease, of whom 2 died." It is also stated that the statistical returns of the hospital here, as well as at Mian Mir, greatly understate the amount of cholera that prevailed among the troops.

One medical officer noted as cholera only the cases that died, and another only the cases that had cramps and suppression of urine, cases presenting mild or choleraic symptoms being returned as diarrhœa.

In the jail, "which has hitherto almost entirely escaped," there were two cases of cholera, both fatal. "The convict first attacked was a sweeper who had assisted at a *post-mortem* examination held by the civil surgeon a few days previously," but it is not stated that the *post-mortem* examination was of a cholera subject; on the contrary, it is stated that "no clear account of the origin of the disease was available." Several of the villages in the neighbourhood of the cantonment "were decimated by cholera," and the district generally suffered severely. In connection with this severe prevalence of cholera in this district in 1872 it is interesting to note the rainfall monthly at Kohat station. The returns are as follows in inches and cents.:—January, 2.20; February, 1.20; March, none; April, 2.10; May, 3.50; June, none; July, 10.40; August, 3.10; September, 0.50; October, 0.80; November, 0.20; and December, none.

Peshawur.—Total deaths 292, of which there were 1 in March, 1 in May, 1 in June, 2 in August, 1 in September, and the rest in October and November. The death registered in May occurred at Mardán on the 28th of that month, the subject being a Native shopkeeper in the regimental bazar of the Corps of Guides stationed there.

He had left Mardán in January to carry the ashes of his parents to the Ganges at Hardwar. On his return he came as far as Lahore by railway. On his way up country from this point he was attacked, as he stated, with cholera at a fair held at Rohtas, near Jhelum, on the 12th April. He arrived at Mardán on the 18th April, and continued to be purged daily till the 21st or 22d May, when the diarrhœa ceased. On the 26th May he dined at sunset off a mess consisting of sliced cucumbers boiled with sour milk and spices; at midnight he was seized with vomiting and purging, and when brought to

hospital was in a complete state of collapse; he died on the 27th, "with all the symptoms of Asiatic cholera."

The death registered in June occurred on the 15th of that month in "an obscure village, and nothing is known of it." Of the two deaths registered in August, one occurred on the 24th of the month, in the city of Peshawur, in a child four years of age. Strenuous efforts were made by the authorities to keep the disease out of the city and cantonment, as soon as it was known to have appeared at Kohat, about the 20th August. Quarantine was established on that side, and also on the Indus at Attock; large fires were kindled in the streets in all parts of the city, and kept smoking with constant supplies of brushwood and sulphur; the city was kept scrupulously clean, and a solution of carbolic acid in water, or of the crude sulphate of iron of the bazar, was daily poured into all the drains. Sanguine hopes were entertained that these measures were to prove effectual, for September passed away, and the only case was that of a man from Kohat, who, after being detained seven days in quarantine, was seized with cholera a few hours after his arrival in Peshawur on the 13th September, and died next morning. The disease was rapidly subsiding in the neighbouring districts, and at last it was deemed safe to remove the quarantine at Attock, "but scarcely had it been so when the disease appeared in its usual explosive form in the city." On the 4th October a man who had been on quarantine duty on the Kohat side was seized in the camp there with cholera, and was privately brought into the city. Two cases of choleraic diarrhœa occurred in this man's neighbourhood, and on the 7th a case of true cholera occurred in the Bara ward of the city. On the same date, also, the disease appeared in cantonments, "and thereafter the cases rapidly became so numerous and detached that it was impossible to trace their origin." In the city the disease reached its climax in the course of a few days, and rapidly subsided from the 20th October to the end of the month, after which only three deaths were registered. Altogether 252 deaths were registered in this short outbreak. The disease mainly prevailed in the Kohati, Kabuli, Ganj, Lahori, and Sarasia wards of the city; "these wards occupy some of the lowest parts of the city, and are traversed by two very filthy watercourses." The cholera of 1872 in this city presents some notable points of difference in respect to season and fatality from the cholera of any of the other epidemic years of which we have any record, viz., 1862, 1867, and 1869. In the epidemic of 1862 the disease broke out in the city in June, and continued till late in November. No records exist as to the mortality caused by it; but there can be no doubt, judging from the severity of the disease among the troops and jail prisoners in the adjoining cantonment, that it was very heavy (see Table No. III.) The subsequent establishment of mortuary registration in the Punjab enables us to give fuller particulars as to the epidemics of 1867 and 1869, and the subjoined statement shows the monthly mortality registered in those years compared with that of 1872, together with the rainfall measured during the same periods: —

		March.	April.	May.	June.	July.	August.	September.	October.	November.	Total.
1867.	Rainfall . .	0·40	2·70	0·80	0·00	0·00	3·10	0·00	0·00	0·00	7·00
	Cholera . .	...	3	241	808	230	77	15	...	...	1,374
1869.	Rainfall . .	2·30	0·20	0·00	0·70	0·00	0·90	7·00	1·60	0·00	12·70
	Cholera . .	...	4	1	1	...	...	1,168	290	16	1,480
1872.	Rainfall . .	2·10	2·20	1·70	0·10	2·70	5·10	0·40	0·00	0·00	14·30
	Cholera . .	...	...	...	...	...	1	1	247	3	252

Here we find that in 1867 cholera commenced activity in April, in coincidence with a very copious rainfall following on a season of drought (for the fall in January was *nil*, and in February only 0.50); this rainfall was to some extent repeated in May, and then ceased for two months. During this period of evaporation from the previously moistened surface of the soil cholera flourished in epidemic form; and with the plentiful fall in August again saturating the soil the disease steadily abated. In 1869 epidemic cholera did not commence activity till the month of September, and it then burst out with "explosive violence," coincidently with an extraordinarily heavy rainfall which succeeded a period of five months of more or less severe drought. In 1872 the rainfall was distributed in such manner that no real drought occurred till October, when for the first time the ground really began to dry; and with the moderate evaporation now going on cholera made its appearance in epidemic form, but with no great severity.

Only 3 other places in this district suffered to any extent from cholera in 1872, viz., Tangi, 46 deaths; Ismail Khel, 26; and Shabkadar, 17; and only 1 other place returned more than 5 deaths, viz., Takál Bala, 6; in 28 other places a total of 44 deaths was registered. The cholera deaths both in the city and district are, it is stated, much understated, registration here being still very defective; besides, the known concealment of the disease in many instances, to avoid the enforced fumigation and disinfection wherever cholera deaths were reported, must have considerably reduced the number of death-entries under that head. The troops at Peshawur also suffered severely; and it appears that, as at Mian Mir and Kohat, the returns did not convey at all an accurate impression of the amount of cholera that prevailed among the troops. Concurrently with the outbreak there was a great excess of cases reported under the head of diarrhœa, many of which, there can be little doubt, were cases of genuine, though mild, cholera.

In the month of August there was an unusually heavy fall of rain, and, owing to defects of surface drainage, some parts of the station and the European infantry lines were, to a great extent, covered with a thin sheet of water for twenty-four or thirty-six hours; but for a considerable period before the outbreak of the epidemic the station was perfectly dry. In September there were four rainy days, on which the total fall of rain measured was less than four-tenths of an inch. In October there was no fall of rain whatever.

The fort of Peshawur, which in former epidemics has enjoyed a remarkable immunity from cholera, on this occasion suffered; there were 6 cases

among the European detachment of 42 men; the Native detachment had no case at all.

Bannu, Dera Ismail Khan, and Dera Ghazi Khan.—In these frontier districts no epidemic cholera was reported in 1872. In Dera Ghazi Khan a single death was registered in that town on the 13th August, and no other throughout the year in this district. In the Bannu district 3 deaths were registered during the year, viz., 2 in September and 1 in October; they occurred on the Kohat borders of the district, at Kalabagh, Isakhel, and Latammar. The civil surgeon was "not disposed to believe them genuine, especially as the malarial fever common at the time (September) was attended often with vomiting and purging, and sometimes with sudden and fatal collapse." In the Dera Ismail Khan district 22 deaths from cholera were registered during the year, viz., 1 in March, 6 in September, and 15 in October. These, on inquiry by the civil surgeon, "proved to be cases of the same severe type of fever as prevailed in Bannu and elsewhere."

Regarding the meteorology of the year 1872 in the Punjab Province, the rainfall constituted the most prominent feature. This year was the rainiest of any since 1863, in which the fall was greater, though that of 1865 was but very little less. The rainfall of 1872 was 31.19 inches, or $3\frac{8}{10}$ inches in excess of the average, and $5\frac{8}{10}$ inches more than that of the preceding year. Its seasonal distribution was proportionally excessive in the first quarter and defective in the last; in the intermediate quarters, though the falls were in excess of the average, the disproportion was not so marked (see Table No. V.); in fact, in the second quarter the excess was only half an inch above the average for that period, whilst in the third it was about $4\frac{1}{6}$ inches above its average fall. Camparing the rainfall with the cholera mortality (see Table No. II.), we find that with the abundant rainfall during the first quarter cholera made no sign of epidemic activity; but with the light falls in the first two months of the second quarter, viz., 0.91 inch in April and 1.40 inches in May, under an increasing temperature, we find that the disease suddenly started into epidemic activity, and that this activity was checked in June by the heavier rainfall of that month, viz., 2.76 inches. Further, we find that this check was increasingly continued throughout July, coincidently with the heavy rainfall in that month, viz., 10.17 inches, and that cholera resumed its suppressed epidemic activity on the slackening of the rainfall in the next and following months, until the setting in of the cold weather in November, when the epidemic suddenly abated. The monthly rainfall and mortality from cholera are shown together in the following statement :—

1872.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Rainfall .	1·78	0·90	1·36	0·91	1·40	2·76	10·17	7·66	3·54	0·17	0·02	0·52	31·19
Cholera .	12	22	18	98	1,073	978	489	2,859	2,424	660	92	2	8,727

The check to the progress of the epidemic by the heavy rainfall in June and July is very well marked, as also is the resumption of its epidemic activity in August, and its continuance through September, with the commencement and continuance of evaporation from a previously well-sodden soil.

The food-supply in 1872 was much the same in respect to prices as that of the preceding year, and rates, without being high, were still not very cheap.

1873.—In this year, the second of the cycle, there was, in the normal course, a very clearly marked abatement in the prevalence of epidemic cholera. Among the troops and jails there was no cholera mortality whatever recorded in 1873, and among the civil population the death-rate was only 0.01 per mille. This marked abatement in the prevalence of the epidemic cholera of the year was coincident with plentiful food-supply and cheaper rates, and with a greatly diminished rainfall, the seasonal distribution of which was such as to produce no period of drought followed by heavy rainfall until the third quarter of the year, in which the fall was proportionately so excessive as to saturate the soil only towards the close of the hot weather.

The year 1872 closed with only 2 cholera deaths registered in December. The year 1873 opened with 4 registered in January; these were followed by 2 in February and 4 in March, and in April, the month in which epidemic cholera activity usually commences to declare itself, there were registered only 10 deaths throughout the province. The highest mortality in any one month was only 50 deaths, in September. Of the 32 districts, 13 returned no cholera mortality whatever, 6 returned only single deaths, and only 3 returned more than 10 deaths each (see Table No. I.) Of the total cholera deaths registered, 80, or more than one-half, occurred in the Gurgaon district, 14 in Delhi, and 14 in Lahore.

In the Gurgaon district cholera appeared in epidemic form only in three places, viz., Garhipati in Palwal subdivision, and Ferozepore and Mahaoli in Ferozepore subdivision. In Garhipati, population 1352, about a mile distant from the town of Hodal, there occurred altogether 52 cases and 22 deaths from cholera. The first case, it is stated, occurred on the 28th June, in a traveller from Bhartpur (where cholera was known to be epidemic) who was on his way to Hodal to attend a great funeral feast. He was "taken ill with symptoms of cholera, and lay down beside a well situated on the roadside about half-way between Hodal and Gharhipati, and there died the same day. One of his companions is said to have had choleraic symptoms in Hodal, but got well, and went away."

The well where the deceased lay down "is close by the roadside, in the middle of cultivated fields, and surrounded by a good stone and lime-mortar parapet at least four feet in height, but there is no platform." At the time of his death "the people of Garhipati were at work daily in their fields, which lay around this well, and they were in the habit of repairing to it daily to eat their mid-day meal. Their children . . were usually left to play around the well." The traveller died on the 28th June; on the 30th 3 children were seized with cholera, of whom 1 died; on the 1st July 2 more children were taken ill and died; on the 2d an adult woman was attacked; and by the evening of the 9th, 18 children had been struck down, and on that day the disease for the first time attacked an adult male; 2 men were seized, also 1 woman. From that date, also, to the end of the outbreak the adults suffered most, viz., in the proportion of 17 adults to 10 children. The last case occurred on the 19th July.

In the town of Hodal, population about 7000, 3 cases of cholera were reported, of which 1 proved fatal. Such, in brief, is the account furnished by Dr. De Renzy of this outbreak in Garhipati. Regarding the outbreaks in Ferozepore and Mahaoli he writes—"The origin of the disease is quite uncertain. All that is known is, that cholera was rife in the adjoining Independent State of Alwar, with which there was free communication." The village of Mahaoli, population 1222, is situated about a mile from Feroze-

pore, "and built on the side of one of the low ranges of hills so common in that part of the country." It is described as an exceedingly dirty village, with its houses crowded together on the side of the hill very irregularly. Its water-supply is from wells in the fields below; in the cold weather the water-level is no more than 6 feet from the surface, and in the rains it is often nearly flush with the surface. Between the 26th September and 10th October 21 cases with 12 deaths from cholera were reported in this village. Ferozepore, population 9156, is one of the cleanest and best-built towns in the province, and quite of modern date, but it is built on a flat sandy plain, the subsoil water-level of which is subject to great alternations of rise and fall; in the cold weather the water-level is about 19 feet from the surface; in the rainy season it rises to within a few feet of the surface. In this town 106 cases of cholera with 38 deaths were reported, all between the 2d September and 14th October.

As already stated, no cholera mortality was recorded among the troops and jails in 1873, but three admissions from the disease were recorded among the Native troops, viz., one each at Umballa, strength 774, in September; at Rawal Pindi, strength 1618, in April; and at Dera Ghazi Khan, strength 1592, in August.

Regarding the rainfall of the year 1873 it is recorded that—

"The most remarkable deviation in this year from the average rainfall occurred in the month of July in the districts of Gurgaon, Delhi, and Karnal. The average fall for the month in these districts for the previous six years having been respectively 6.98, 6.83, and 7.86 inches, the fall in 1873 was respectively 24.90, 16.20, and 21.30 inches. In Gurgaon and Delhi the fall for August was below the average, but above it in September. In Karnal the fall was slightly above the average in August, and considerably above it in September."

Regarding *temperature* it is recorded that—

"Great range of daily temperature is a marked peculiarity of the climate of the Punjab. Thus, while the mean daily range of temperature in different places in England only varies from 8.9° to 15.8°, at Lahore it is 31.91°, and in the months of May and November it reaches the extraordinary high figure of 38°. At Mooltan, Rawal Pindi, Dera Ismail Khan, and other stations the range of temperature is quite as high as it is at Lahore—in some of them even higher. July, August, and September are the months in which the mean daily range is smallest, but even in these months it does not descend below 24° F. A great range of daily temperature is usually supposed to be unfavourable to health, but when this condition is associated, as it is in the Punjab, with great dryness of the air, it is probably productive of comparatively little injury. Indeed, in the hot weather months the high range of temperature is eminently favourable to health, for the cool nights afford a refreshing sleep, which would be impossible were the intense heat of the day continued. The greatest extremes of temperature occur at the stations of Dera Ismail Khan and Mooltan, where the thermometer ranges in the year between 25° F. and 120° F. At Lahore, too, the range of temperature is extraordinarily great; the smallest monthly range, viz., 42° F. occurs in March, and the highest, viz., 58° F., in the following month of April. The mean temperature of stations in the plains varies from 73° at Rawal Pindi to 77.7° at Mooltan, that of Greenwich, which may be taken as a standard of comparison, being 49.4°."

Regarding *humidity* it is recorded—

"Another marked peculiarity of the Punjab climate is its dryness. Thus, while the mean humidity of Greenwich is 81, that of Lahore is only 44, saturation being 100. At Mooltan the mean humidity of June 1867 was only 19, saturation being 100, and the mean humidity for the month of May rarely exceeds 28."

These remarks on the general meteorological peculiarities of the Punjab by Dr. A. C. C. De Renzy are very instructive in reference to the relation between the rainfall and the prevalence of epidemic cholera, and show that

it is moisture or humidity of the air, combined with its range of temperature, which converts the wholesome dry heat to an unwholesome damp chill.

The food-supply of 1873 was abundant, and prices cheaper than in any previous year since 1864, though in 1866 they were nearly as cheap as in this year.

1874.—In this year, the third of the cycle, the periodic cholera epidemic terminated its triennial cyclic course, and the epidemic cholera of the year subsided to a minimum of prevalence. The incidence of cholera in 1874 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section. Among the civil population the death-rate was merely nominal, only 0.004 per mille. This complete subsidence of epidemic cholera activity in 1874 was coincident with a continuance of cheap food, and with a continuance of diminished rainfall, the amount and seasonal distribution of which varied but little from that of the preceding year, except in the rainfalls of the first and second quarters.

Among the civil population of the province generally the cholera of 1874, like that of the preceding year, was in abeyance in all parts throughout the year. Of the 32 districts (see Table No. I.), 10 returned no cholera mortality whatever, 15 returned only one or two deaths each, and only 2 returned more than 10 deaths each, viz., Delhi 15 and Umballa 14, the next highest number being returned by Lahore, 9. The returns show cholera in every month of the year, the highest mortality in any one month falling in September, the next in April, and the next highest in the intermediate months (see Table No. II.)

There were only two places in which the disease appeared in anything like epidemic form, viz., the towns of Jagadhri in Umballa and Sônpat in Delhi. Regarding the outbreak at Jagadhri, population 12,300, the following particulars are recorded:—

On the morning of the 11th April a dealer in brass pots was suddenly seized with cholera, and died in eighteen hours from the commencement of his illness, which his friends attributed to his having eaten stale rice the previous day. A second case occurred on the night of the same day (11th April) in quite another part of the town, and without, so far as could be traced, any communication with the fatal case; it occurred in a young woman, aged 22; she woke up from sleep with violent sickness and purging, and died in the afternoon of the 12th. No other member of the household suffered in either of these cases, nor was diarrhœa or any other sickness prevalent in the town at the time. A third case occurred on the 20th, and proved fatal after a few hours' illness. At this time a number of persons had been taken ill with vomiting and purging, "attributed to the too free use of Native confectionery." It appears, also, that "for a week or so the town had been crowded with marriage processions." On the 21st there were 8 cases under treatment by the assistant surgeon, viz., 2 boys and 6 adults, all of whom had partaken largely of wheaten cakes fried in butter, and all of whom "presented the same symptoms, viz., vomiting, purging, and pain in the belly." These cases all recovered, as also two others which occurred on this day, and were seen by the civil surgeon himself, who reported that "the symptoms were as like those of cholera as they possibly could be."

Of these two cases seen by Dr. Penny, "one was an old woman, who is said not to have belonged to any of the processions, nor to have eaten any confectionery; the other was an old toothless man, who was one of a wedding party, and had partaken very largely of *kachauri* (pancakes fried in butter)." Subsequently, between the 30th April and 9th May, 36 cases, which are returned as "cholera and indigestion," came under treatment. Only one of them proved fatal, and the following is the history recorded:—"The patient had been one of a marriage party on the 6th. On the evening of the 7th, after he had taken his wedding dinner, which consisted mainly of *kachauri* and *púri*, he felt a peculiar sensation and griping in his belly, followed by vomiting and purging. The vomited matter and stools were at first yellowish in colour and partially solid, afterwards colourless and liquid. When first seen by the assistant surgeon he was affected by incessant vomiting and purging, pain in the belly, spasms of the lower limbs, the skin being covered

with cold sweat, thirst intense, eyes sunken, and bladder empty, no urine having been voided for some time previously. He died after about sixty hours' illness. On the 17th May another case, "very similar to the above," occurred in a young lad of 13. He too was taken ill shortly after a hearty meal of *kachauri* and *púri*. "Except a few cases occurring in the adjoining town of Búrya, "there was no suspicion of any taint of cholera in the district; and in that town, as in Jagadhri, the people were in a state of unusual gaiety, enjoying marriage festivities, and subsisting largely on the confectionery called *kachauri* and *púri*."

In explanation of the outbreak of this sickness, Dr. De Renzy further writes—"That the people were weary from a long journey and exposure to the intense heat. In this state they spent their nights in revelry in the midst of dancing-girls, fiddlers, tom-tomming, &c. The circumstances were certainly most trying to health."

Regarding the outbreak of cholera at Sônpat, population 12,176, the following particulars are recorded:—

The first case of cholera in the town, recognised as such, occurred about the 18th August, in a man who had been suffering from fever for two days previous to the supervention of symptoms of cholera; he died the day of the cholera attack. The next case occurred on the 24th August, and proved fatal the same day, the victim being a Brahmin lad, aged 11. Subsequently 2 other cases occurred; they recovered. On the morning of the 2d September 2 other cases, both fatal, occurred; and 2 fresh cases were reported on the 5th; these were seen by an assistant surgeon sent out from Delhi, and he pronounced them to be cases of genuine cholera. "He also found that the people were very indisposed to give any information regarding the disease, and that they were concealing it as far as they could. The reason of their acting in this way was apparently the fear of having their houses visited by the police for the purpose of fumigating the apartments occupied by the sick, and having the premises otherwise cleansed." On the 9th September the town was visited by the civil surgeon, who "saw several cases which he pronounced undoubted cholera;" and he reported—"The cases occur all over the town, and are not confined to one locality." Altogether 33 cases and 15 deaths were registered, the last on the 22d September. No case of cholera was reported from any other part of the district.

Regarding the isolated cases of cholera reported from different parts of the province, the following particulars are recorded concerning two of them. On the 21st April a sporadic case of cholera occurred at Gurdaspur; the man was a sheriff's messenger; he was apparently in good health during the day, he sickened at night, and died the next afternoon in the station hospital. On the 28th June a dispensary student died of cholera in the Umballa city.

"In the evening previous to his illness he was in the dispensary in perfectly good health. His evening meal consisted of, among other things, mangoes and Native confectionery called *búndi* and *kachauri*. The youth was sleeping on the roof of his house, when, at twelve o'clock at night, it began to rain. He got up to remove his bedding downstairs. It was then that he was suddenly seized with vomiting and purging. He was greatly weakened after the first motion, and had so much thirst that he continued drinking from a jar till he finished it. About 7 A.M. the assistant-surgeon was sent for, but before he arrived the youth was dead."

Cases of sporadic cholera, of which the above-described are examples, are of exceedingly frequent occurrence in all parts of India, and at all times and seasons. They are most commonly returned, when fatal, as deaths from indigestion, diarrhœa, fever, or colic, and seldom as cholera. Regarding the meteorology of the year 1874 in the Punjab Province, it is recorded that the temperature during the early months was comparatively low, owing to the heavy rainfalls in January, February, and March. Also, "during June there was a greater amount of rain than usually falls about that time of the year in the more northern latitudes of India. About this time of the year the south-west monsoon increases in strength, and drives the south-east wind current towards the mountain chain to the north-east. It may be laid down as a rule that, according as the south-west monsoon prevails, the greater part of the rain will be confined to the southern and eastern districts of the

province; while, on the other hand, if the south-east monsoon prevails, the rain will have a wider distribution both to the north and west. By the time the south-west monsoon reaches the Punjab it will have lost much of its moisture in blowing over the deserts to the south-west. The south-east monsoon, on the other hand, blows over some very moist localities, and carries more moisture in suspense with it. According, therefore, as it prevails in strength, the wider will be the distribution of rain during the proper season."

1875.—In this year, the first of the next triennial cycle, 1875–77, the cyclic cholera epidemic made its appearance in normal periodical recurrence, and, as will be seen in the sequel, ran its regular epidemic course through the successive years of the cycle, the activity of the disease in the second year, however, being somewhat greater than usual. In 1875 the cholera death-rate among the troops and jails was 1.66 per mille of strength, and among the civil population it was 0.36 per mille. This mild commencement of the cholera epidemic of this cycle was coincident with unusual abundance of the food-supply and very cheap rates, and with a great increase of the rainfall, the entire excess of which fell in the third quarter of the year, with the effect of saturating both soil and air with moisture, and thus restricting the free play of evaporation during the hot weather within very limited bounds.

The incidence of cholera in 1875 among the troops and jails is shown in abstract in the tabular statements Nos. III. and IV. at the head of this section.

Among the civil population the mortality registered from the cholera of 1875 is shown by districts in Table No. I., and by months in Table No. II. The distribution of the disease by areas and seasons was very peculiar in this year, and is worthy of special note in relation to the rainfall of the year, which was also very peculiar in its distribution by areas and seasons.

Following a year of almost complete cholera quiescence, the year 1875 opened with the disease in continued abeyance. Throughout the province only four deaths from this cause were registered in each of the first three months of the year. In April there was a scarcely appreciable increase in the provincial mortality from the disease; but in May the epidemic cholera of 1875 in the Punjab declared its commencement by a sudden activity of the disease in the southern districts of Delhi and Rohtak, and in June in the districts of Gurgaon and Umballa. In July the epidemic advanced to Amritsar, in August to Lahore and Gurdaspur, and in September crossed the River Ravi into Sialkot. Beyond this point the epidemic cholera of 1875 did not advance further westward in the Punjab, whilst in the country eastward of that river it left unaffected the district of Ferozepore and the districts of the Mooltan division.

Speaking in general terms, the cholera of 1875 in this province covered an arc of its area extending from Gurgaon in the south-east to Sialkot in the north-west, with the convexity of the arc along the base of the Himalayas. All the districts to the west of Lahore and Sialkot, with those to the south and Ferozepore on the east, taken together, registered an aggregate cholera mortality of only 22 deaths out of the 6246 registered in the province during the year. The cholera of 1875 in the Punjab may be said to have been strictly confined to the country lying to the eastward of the River Ravi, the limit of that river having been overstepped only in the Sialkot district. In this district the epidemic did not appear till September, and even here, in common with the rest of the affected area, the disease subsided during the

month of November; for in December, excepting the one last death of the epidemic at Amritsar in that month, there was no cholera mortality registered in any part of the province. Thus, then, the cholera of 1875 in the Punjab, commencing in May in Gurgaon and Delhi, advanced to Umballa in June, and then, curving along the line of the mountains, ceased its progress at Lahore and Sialkot, and after an active epidemic prevalence in the area thus covered, completely disappeared everywhere by the end of November.

The monthly death returns show that the cholera of 1875 in the Punjab progressed in its increasing prevalence steadily by the monthly duplications of mortality from June to August inclusive, and that it attained its period of greatest fatality in September; that in the following month its fatality declined by somewhat less than a half that of the preceding month, and that in November the disease ceased its activity altogether, after causing in that month somewhat more than one-third the mortality with which the epidemic had started into activity in the preceding June. This multiple advance of the disease month by month till the epidemic attains its climax is a feature which is traceable more or less clearly in all epidemic manifestations of cholera over extended areas of which we have the statistical records, and is a point deserving of attention in reference to the rainfall and its effects upon the soil, no less than to the condition of the soil itself when it receives the rainfall. The same feature is not observable in the decline of epidemic cholera with the same distinctness; this is more generally sudden and fluctuating, though some sort of proportion is occasionally traceable in the rate of decline with that of rise in some of the months of each period.

In order to contrast the diffusiveness of cholera with the communicable disease best known in the province, Dr. De Renzy prepared the following tabular statement showing the number of villages in each district in which cholera, and the number in which smallpox, prevailed in 1875, to which I have added the mortality registered from those diseases separately in each district during the same year:—

STATEMENT *showing the Number of Villages in each District of the Punjab Province in which Cholera and the Number in which Smallpox Deaths were registered in 1875, together with the Total Mortality from each Disease.*

Districts.	Number of Villages and Towns in each District.	CHOLERA.					SMALLPOX.				
		Number of Deaths Registered.	Villages and Towns Registering		Number of Villages		Number of Deaths Registered.	Villages and Towns Registering		Number of Villages	
			Less than Five Deaths.	More than Five Deaths.	Affected.	Not Affected.		Less than Five Deaths.	More than Five Deaths.	Affected.	Not Affected.
Delhi . . .	743	287	13	14	27	716	226	40	7	47	696
Gurgaon . .	1,239	526	48	26	74	1,165	2,741	415	136	551	688
Karnal . .	868	72	4	3	7	861	1,184	265	78	343	525
Hissar. . .	715	142	9	5	14	701	546	77	23	100	605
Rohtak . .	498	239	21	15	36	462	217	37	8	45	453
Sirsa . . .	626	26	8	1	9	617	537	107	35	142	484
Umballa . .	2,225	349	56	24	80	2,145	1,907	543	94	637	1,588
Ludhiana .	851	83	22	6	28	823	800	211	26	237	614
Simla . . .	238	158	11	1	12	226	2	1	...	1	237
Jullundur .	1,233	63	5	3	8	1,225	77	31	3	34	1,199
Hoshiarpur .	2,178	236	22	12	34	2,144	177	102	7	109	2,069
Kangra . .	704	710	105	40	145	559	63	7	2	9	695
Amritsar. .	1,078	1,269	78	29	107	971	251	126	7	133	945
Gurdaspur .	2,302	1,482	110	53	163	2,139	230	121	3	124	2,178
Sialkot . .	2,315	294	10	13	23	2,292	270	102	13	115	2,200
Lahore . .	1,672	288	18	10	28	1,644	424	158	12	170	1,502
Gujranwala .	1,177	9	...	1	1	1,176	73	35	2	37	1,140
Ferozepore .	1,276	1	1	...	1	1,275	296	31	3	34	1,199
Rawal Pindi	1,725	1	1	...	1	1,724	145	57	3	60	1,665
Jhelum . .	1,042	1	1	...	1	1,041	47	24	1	25	1,017
Gujrat . .	1,416	2	2	...	2	1,414	21	17	...	17	1,399
Shahpur . .	632	...	...	...	...	632	292	86	15	101	531
Mooltan . .	1,233	1	1	...	1	1,232	126	65	3	68	1,165
Jhang . . .	976	...	...	...	...	976	788	177	58	235	741
Montgomery	1,518	2	1	...	1	1,517	683	229	35	264	1,254
Muzaffargarh	534	...	...	...	...	534	2	2	...	2	532
D. I. Khan .	772	2	2	...	2	770	26	9	2	11	761
D. G. Khan.	442	1	1	...	1	421	4	4	...	4	418
Bannu . .	553	...	...	...	...	553	17	11	...	11	542
Peshawur .	730	2	2	...	2	728	1,018	124	22	146	584
Hazara . .	1,013	...	...	...	...	1,013	358	101	26	127	886
Kohat. . .	469	...	...	...	...	469	46	9	3	12	457
Totals .	34,973	6,246	552	256	808	34,165	13,594	3,403	640	4,043	30,930

The statement shows a total of 34,973 villages and towns in the province, of which 808 were attacked with cholera and 4043 with smallpox; so that smallpox, notwithstanding the protection afforded by previous attacks of the disease by natural contraction, by inoculation, and by vaccination, attacked just five times as many villages as cholera did; while the number of its victims was little more than double, the number of smallpox deaths being 13,954, that of cholera 6246. On examining the list of villages attacked in the epidemics of 1869 and 1872, Dr. De Renzy found that "comparatively few of the names of villages attacked in 1875 are to be found, though, as might be expected, the names of the large cities appear in more than one of the lists."

It is recorded that "in former epidemics it has been the practice, on the appearance of cholera in a district, for the adjacent districts to set up quarantine cordons, with a view to the exclusion of the disease. Where a large river

formed the boundary between the affected and unaffected districts, the ferries were taken possession of, and travellers detained in quarantine camps for periods varying from four to ten days in a very comfortless condition. In cases where mountainous tracts adjoined, lines of patrols, scores of miles in length, were formed, the object being to stop all intercourse. This system entailed grievous hardships on the people, and involved a most serious interference with the traffic of the country; and as it seemed to have no effect whatever in restraining the extension of cholera from district to district, His Honour the Lieutenant-Governor was pleased," on the recommendation of Dr. De Renzy, the Sanitary Commissioner for the Punjab, "to issue an order prohibiting district officers from establishing such quarantines without the special sanction of Government." The discontinuance of quarantine in 1875," adds Dr. De Renzy, "had no bad effect whatever. In no previous epidemic has the cholera mortality been so small." This mild cholera in 1875, however, had nothing to do with the discontinuance of quarantine, as may be very well understood.

I now proceed to follow the course of the epidemic cholera of 1875 through affected districts of the province. The following particulars, as in the case of previous years, are derived from the Sanitary Report for the Punjab by Dr. De Renzy for the year under notice:—

Delhi.—Total deaths registered 287, of which 1 occurred in January, the rest in the months from May to November inclusive. Altogether 27 places recorded cholera, of which 14, returning 5 or more deaths each, registered together 267 deaths, and 13 others together 19. The largest number of deaths in any one of them (57) occurred in the suburbs of Delhi, population 43,402, and the next largest (44) in the city of Delhi itself, population 115,906. The first known case of cholera in this district, apart from that in January, occurred in Delhi city among a body of tanners inhabiting one of its dirtiest quarters. From the 6th to 11th May there were 11 seizures and 2 deaths. On the 10th May a case occurred in the Sadr bazar, outside the city, in a man who had that day arrived from Karnal. This man's son, a boy of three years, was attacked on the 14th May, and died the same day. Between the 10th and 18th May there were 6 "apparently entirely unconnected cases, which occurred in different parts of the city." After the 18th no cases of cholera were observed for nearly a month. While dropping cases were occurring in the city, the disease broke out on the 14th May in the village of Bakirgarh, population 143, about 18 miles westward of Delhi, and from that date to the 18th there were 14 cases with 8 deaths in that small community. From the 19th May to the 9th June no cholera was reported anywhere in this district. On the 10th June the disease appeared in the village of Kakraula, population 866, situated about midway between Delhi city and Bakirgarh, and here in the course of eleven days there were no less than 53 seizures and 28 deaths. On the 18th June cholera appeared in the village of Bajbasan, population 1262, within 7 miles of Kakraula, and in ten days killed 15 out of 19 persons attacked. On the 20th June the disease appeared in the village of Tehar, population 1665, near Kakraula, and in eight days there were 21 seizures and 8 deaths. On the 27th June cholera appeared in Najafgarh, population 3592, where there were 47 seizures and 17 deaths. Between the 25th June and 14th July one village south of Delhi and two north-west of it, and all three, situated within 12 miles of the city, were attacked with cholera, and suffered severely.

On the 14th June a solitary case of cholera reappeared in the city of Delhi, in a woman of the town. No other case was reported in the city till

the 26th June, when a carpenter, who had just returned from Najafgarh, was seized with cholera.

He had gone to see his brother, who was sick of cholera, and who subsequently died, and had brought back with him some of his things, including a blanket containing the deceased's ashes.

Single cases were reported from different parts of the city and suburbs on the 4th, 6th, 8th, 18th, and 23d July, and after the last date cases were of daily occurrence both in the city and suburbs, and from about the 20th August to the 20th September the disease was at its height. The greatest number of cases on any one day (13) occurred on the 29th August, on which date also occurred the greatest number (6) of deaths. From the 20th September the disease rapidly declined, although scattered cases continued to occur up to the 11th November. The suburbs suffered more severely than the intra-mural city. "The cases were nearly all isolated, and apparently unconnected with one another, being dotted all over the city and suburbs, no locality being specially selected for attack."

From the rural portions of the district no cholera was reported from the middle of July till towards the end of August, when the village of Fatehpur Baloch, population 3874, was attacked on the 24th of the month; and the disease lasted till the 21st September. There were here 79 seizures and 27 deaths. On the 16th September cholera appeared in the town of Ballabgarh, population 6281, and 7 miles distant from the last, and in five days there were 23 seizures and 11 deaths. About the same time outbreaks occurred in different villages. Of these the most important was at the village of Azadpur, population 385, situated on the Grand Trunk Road, 4 miles from Delhi. "Up to the 19th September this little community had been in the enjoyment of its usual health, but within twenty-four hours 21 of its members were struck down by cholera, of whom 8 were dead. The people were panic-stricken by this great calamity, and deserting the village almost in a body, fled into groves some distance off, and there 10 more of their number were seized, and then the epidemic ceased. There were altogether 21 deaths."

As regards the state of the weather during this epidemic, it is stated—"There was nothing peculiar when the epidemic first appeared;" the weather "was such as usually prevails at this season in Delhi. Towards the close of the season, and when the epidemic was at its height, an extraordinary fall of rain occurred, such as had not been seen in the district for fifty years. On the 8th and 9th of September, in the space of thirty-six hours, no less than 25 inches of rain fell." The rainfall of the year 1875 at Delhi, as shown in the rainfall statements, however, was distributed over the several months as follows:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Rainfall.	0·10	1·20	0·00	0·00	0·50	0·40	3·40	5·10	27·40	0·10	0·00	0·00	38·20

This distribution of the rainfall accounts for the commencement of the epidemic in May and its activity in the next three months, and the heavy fall in September explains the abatement of the disease in that month. In the two weeks preceding the great fall of rain above mentioned, that is, from the 22d August to the 4th September, there were altogether 33 cholera deaths

registered, viz., 11 in the city and 22 in the suburbs; during the week in which the fall occurred, that is, from the 5th to the 11th September, there were only 9 cholera deaths registered, viz., 4 in the city and 5 in the suburbs; and during the succeeding two weeks, that is, from the 12th to the 25th September, altogether 14 cholera deaths were registered, viz., 6 in the city and 8 in the suburbs. Finally, during the next six weeks ending 7th November only 10 deaths from cholera were registered, one or two in each week, and all in the city. It is recorded that there was a marked absence of diarrhœal complaints throughout the epidemic in all classes of the population under close medical observation, including the European and Native troops, the convicts in jails, and the lunatics in the asylum. Also that the cases of cholera, with extremely few exceptions, set in suddenly without any premonitory diarrhœa, and "that neither before, during, nor following the Delhi outbreak was there any unusual development of fever. Indeed, considering the rainfall of September, there was remarkably little fever in that month and afterwards." The total number of cholera cases reported in this district was 621, and of deaths registered 287, during the year, the deaths including 11 Europeans and Eurasians.

The epidemic in Delhi city was accompanied by a very remarkable outbreak of a disease among cats, which in all its symptoms closely resembled cholera, and was considered by Dr. Fairweather, the civil surgeon, to be identical with that disease. This disease, or cat-plague, first attracted notice about the middle of August. One morning fifteen dead cats were brought to hospital for examination; four were examined, and Dr. Fairweather was surprised to find that the contents of the intestines consisted of the rice-water fluid characteristic of cholera. There were no solid fœces, and there was no appearance of bile in the gall-bladder. All the animals were found to be infected with either round-worms or tape-worms. The liver, heart, lungs, and viscera generally were found quite healthy. Vomiting and purging of rice-water fluid and coldness of the body were the symptoms of the disease during life. The disease proved fatal very rapidly. For many days from fifteen to twenty cats were brought to Dr. Fairweather for inspection, and it has been calculated that not less than 500 cats died during the epidemic. Dr. Fairweather made several experiments with a view to ascertain whether cats were liable to contract cholera from having the evacuations of cholera patients mixed with their food, but with no decisive result, for, though some cases seemed to contract the infection, in many others no such effect followed. The intestines of several cats were sent to Drs. Lewis and Cunningham for examination. These gentlemen reported that "the specimens showed no anatomical or microscopical appearances indicating that the animals from which they were obtained had been affected by cholera or any similar disease."

A somewhat similar epidemic among cats during the prevalence of epidemic cholera is recorded to have occurred in 1881 at Ahmednagar, and in 1883 at Sirur, both in the Bombay Province. At Ahmednagar in 1881 cholera prevailed from the beginning of July to the middle of August, and from the 1st to the 25th of July about 750 cats were reported to have died. The symptoms of the disease are described as follows:—"For a day or two before it died the cat appeared inactive, took no food, and tried to find some cool place where it could rest. The throat of the animal became swollen and choked, and when it died it foamed at the mouth." At Sirur in 1883 cholera broke out on the 19th May and ceased on the 22d June. From the

1st to the 21st June 125 cats were reported to have died of a disease of which the chief symptom noticed was vomiting, but there was no diarrhœa. Great salivation and foaming at the mouth were invariably present, and there was great heat and fever; a marked feature of the disease was that at an early stage the features of the animals became pinched and shrunken and the eyes sank back in the head; death was by coma or convulsions in from ten to thirty-six hours after attack. At the beginning of June the cats in Sirur died at the rate of twelve a day, and altogether, it is supposed, 300, or half the total number in the town, died during the epidemic. In these instances the dead animals were not examined.

Gurgaon.—Total deaths 526, all from May to October; in May 1, and in October 9, the rest in the intermediate months. Altogether 74 places recorded cholera, of which 26, returning 5 or more deaths each, together registered 449, and 48 other places 77. The total number of seizures reported was 1257. The towns returning the largest number of deaths were Palwal, population 12,729, deaths 161, the first on 15th August; Rewari, population 24,503, deaths 35, the first on 28th June; Aurangabad, population 2725, deaths 30, the first on 23d August; Sohna, population 8243, deaths 23, the first on the 20th July; Hattin, population 2832, deaths 20, the first on 4th July; Tethar, population under 500, deaths 20, the first on 4th September, &c. The town of Rewari entirely escaped the cholera of 1872, and returned only 6 deaths from the cholera of 1869. It was the same with Palwal, even to the number of deaths (6) returned in 1869. Rewari is built on a flat sandy plain, and lies low; Palwal is built on a high mound composed of ancient debris.

Rohtak.—Total deaths 239, of which 1 was in January, the rest from May to November. In July the deaths were 130. Altogether 36 places recorded cholera, of which 15, returning 5 or more deaths each, together registered 205, and 21 other places 33. The places affected were mostly on the borders of the Delhi district.

The number of places affected in the several districts is shown in the tabular statement given on a preceding page, and it is not necessary here to give the details for each district separately, those above described sufficing as examples for the others. The circumstances related concerning the appearance of the disease in some of the districts are, however, worth recording.

Simla.—In this district the first case of cholera reported occurred on the 26th June at Kakarhatti, a village on the old road between Kalka and Simla, when a mendicant was attacked. By the end of the month 5 deaths were reported. Regarding these cases Dr. De Renzy writes—

"It is right to state that the medical officer of the Subathu cantonment, which is close to Kakarhatti, came to the conclusion that the disease was not cholera but Peshawur fever. On the other hand, a hospital assistant who examined the cases reported that the disease was true cholera, and there can be little doubt the hospital assistant was right. This case illustrates the difficulty that not infrequently arises in the diagnosis of cholera."

At Simla Sanitarium, population 14,848, elevation 7084 feet above the level of the sea, the first recognised case of cholera occurred on the 26th June, in a policeman who was on duty at the time at the police station on "The Ridge," the most central and exposed part of the station. The next case occurred on the following day, in a tent-pitcher residing at the Chaura Maidan, who had been ill with fever for some time, and had not

stirred from his master's house. On the 28th there were 3 cases and 2 deaths in a party of jhampanis (sedan-bearers) who had just returned from Kalka *via* Kakarhatti. On the 30th June there was another case. After this it became impossible to follow the seizures or deaths, for—

"In the first place many natives fled from the Sanitarium on the first feelings of illness through fear of being carried away for treatment to the cholera hospital; secondly, a large number of cases of choleraic diarrhœa, or, in other words, mild cholera, occurred, of which no record was preserved; and, thirdly, some of the medical officers returned as cholera only the cases that proved fatal."

However, the numbers of cases and deaths reported from the 26th June to the close of the epidemic on the 25th August were as follows:—Natives, 316 seizures and 170 deaths; Europeans, 25 and 14 respectively. The disease showed no marked preference for any locality in particular.

"The bulk of the cases and deaths naturally fell where the population was greatest, that is, in the bazars; but houses were attacked in situations high and airy quite as much as those in places rather close and confined. In a house, 'The Highlands,' on the summit of Jakko, at an elevation of 8120 feet, there were 3 cases, 1 fatal. In another house, 'The Craggs,' in the same neighbourhood, at a little lower elevation, there were 3 cases, all fatal; in another, 'Rock Cliff Cottage,' just below the bandstand, there were 8 fatal cases."

As regards the prevalence of the disease in the country around Simla, it appears that in 11 places affected an aggregate of 150 seizures and 106 deaths occurred between the 1st July and 10th August.

The rainfall at Simla in 1875 was unusually heavy; 91.39 inches were measured. The monthly distribution of this fall was as follows. The drought and light falls in March, April, and May are points worthy of notice:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Rainfall .	1·77	7·62	0·83	0·00	5·11	8·50	25·64	27·88	12·56	0·42	0·18	0·88	91·39

Kangra.—In this district the epidemic prevalence of cholera was not observed till the 17th June, when several villages in the vicinity of Joalamukhi, a famous place of Hindu pilgrimage, were attacked. In Joalamukhi itself, population 3535, only 3 cholera deaths were registered between the 25th and 30th June. At Dharmsala, the headquarters station of the district, population 2121, there were 48 cases and 31 deaths. The Gurkha regiment quartered here suffered very severely. "A very sad instance occurred of the terrible havoc which cholera now and then makes in families.

"A lieutenant of the Veteran Establishment resided in Elgin Cottage, a well-situated, comfortable house. His family consisted of himself, his wife, and three children. On the 5th July two of the children were seized with cholera, and died the same day. On the 10th the third child was stricken and died, and finally he himself fell a victim on the 12th, leaving his wife the sole survivor of the previously healthy family."

Among the European civil community in this station there were 10 cases with 7 deaths.

Amritsar.—In this district cholera was first observed in the city of Amritsar on the 26th July, when a case occurred in the house of a wealthy shawl manufacturer, whose daughter, aged two years, was seized with the disease. The house was one of the best in the Ramgarhian ward of the city. Within twenty-four hours of this case 8 others occurred, all in the immediate vicinity, one of them in the same house, and all in persons of the same caste. For a whole week, during which 80 persons were attacked, the cases were confined to the locality of the house in which the disease first appeared, and to Kashmiris. After a week cases began to appear in nearly every part of the city, and among all castes and sects. The disease lasted in the city up

to the 11th October, and during this period of 78 days there were 1060 cases and 756 deaths registered. The civil surgeon was of opinion that the cholera mortality of 1875 was greatly understated, "owing to the aversion of the people to the rule that all houses in which cholera occurred should be cleansed and disinfected" by the police agency. The rainfall at Amritsar and the total cholera mortality of the district are shown by months for 1875 as follows:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Rainfall	0·00	1·90	0·00	0·00	1·30	0·90	8·20	16·70	12·20	1·20	0·00	0·60	43·00
Cholera	...	...	...	...	...	1	28	504	583	149	3	1	1269

Here mark the drought and absence of cholera during the first six months in contrast with the rainfall and activity of cholera in the last six months.

Lahore.—Total deaths 288, of which 5, in single cases each month, were registered in March to July, and the remainder from August to November, the greatest mortality being in September. Altogether 28 places recorded cholera, of which 10 together registered 259 deaths, and 18 others 29. The epidemic commenced in August and ceased in November. In Lahore city the first case observed was on the 1st August, in a man who "had fever for a day or two before his sudden death from diarrhœa." On the same date a case occurred in the town of Patti, situated on the much-frequented road from Hariki. The next case was in Lahore city on 3d August. The patient was a Hindu water-carrier, who, the previous night, after his evening meal, slept outside a shop on a bed placed over a drain in the open bazar. He awoke with vomiting and purging, and in the morning was in a state of collapse. He recovered. The next case, on the 4th August, was in a child, and then an interval of twenty-two days elapsed without any case appearing. On the 27th August a child who had been brought the previous evening by train from Amritsar was seen by the civil surgeon, and found in a state of collapse from cholera. On the next day another fatal case occurred, also in a child, in the Kashmiri quarter of the city, "but no possible connection could be traced between it and the one of the previous day." On the 29th and 30th no case was reported, and on the 31st another fatal case occurred in a man who had come the previous evening from Amritsar. On the 1st September a case occurred in the Lunatic Asylum, in a man who had been an inmate for many years, and suffered occasionally from diarrhœa. On the 5th September the daughter of a police constable was attacked, and on the 8th the disease became epidemic in Anarkali and the suburbs of Lahore, and continued more or less prevalent till the 26th October; 118 cases and 87 deaths were reported in the city, population 85,346, and suburbs, population 31,761, together. The civil surgeon reports—"Unquestionably many cases were not discovered, and the total can be considered only approximately correct. On the other hand, many cases were returned as cholera which were simply fever with bilious diarrhœa." In the Lunatic Asylum between the 1st September and 7th October there were 27 cases and 19 deaths out of a strength of 275 lunatics. Out of 27 keepers none were attacked. At first the disease was confined entirely to the harmless lunatics. They were moved into camp, 175 in number, on the 3rd October, and no other case occurred among them after the move; but between the 3rd and 7th October 4 cases occurred among the criminal lunatics, who had been left in the asylum. They were moved out on the 10th, and no case occurred after the move. The admissions and deaths were as follows:—

Months.	Admitted.	Died.	Total.
September . .	Males 11—Females 2	Males 6—Females 1	Admitted 13—Died 7
October . . .	„ 13 „ 1	„ 12 „ 0	„ 14 „ 12
Total . .	„ 24 „ 3	„ 18 „ 1	„ 27 „ 19

The first case occurred on the 1st September in a male lunatic, who died the same day. The next case did not occur till the 18th September, when another male lunatic was attacked, and died the same day. No other case occurred till the 26th, when 2 male and 1 female lunatic were attacked, of whom both the male lunatics died the same day, and the female the day following. On the 28th there were 5 cases, viz., 4 males and 1 female, of whom 1 male died that day. On the 30th there were 3 more cases, all males, and 1 death. On the 1st October there were 3 more seizures, all males, and 1 death. On the 2d there were 3 seizures, viz., 2 males and 1 female, and 2 deaths, both males. On the 3rd 4 males were attacked, and 3 died. On the 4th there was no seizure, but 1 death of 2 previously attacked. On the 5th and 6th there was 1 male attacked each day, with 2 deaths on the 5th and none on the 6th. On the 7th the two last cases occurred, both males, and on this day there were 2 deaths, both males. On the 9th the last death occurred, a male. With the exception of the two first cases all the cholera seizures occurred between the 26th September and 7th October. On the 1st October Dr. De Renzy visited the asylum, found "that none of the keepers, or, as far as could be ascertained, none of their females, were attacked," and discovered that the only point of difference in the sanitary condition of the two classes was "that the drinking-water of the lunatics was obtained from a well near the railway station, which was largely used by the people of the unhealthy bazars in the neighbourhood, and also by travellers, while the keepers used water taken from a well close by the asylum." At Dr. De Renzy's recommendation, "water was no longer brought from the railway well, but from the well resorted to by the keepers, the old water-vessels were broken, the filters removed, and arrangements were made for having the water boiled before filtration." These arrangements were at once carried out, and "were completed on the 1st October; and it was decided to allow forty-eight hours to elapse before coming to any conclusion as to the effect."

The result was that, several cases being reported after the termination of that period, "it became clear that there must be some other channel of infection besides water; and as the usual encamping-place had by this time become dry, it was determined to remove the lunatics from the asylum. The result of the move, as already stated, was that there were no further cases."

There are two points here deserving of notice, namely, first, that this crucial test of the water theory of cholera communication completely failed, for there occurred at least eight fresh cases after the new water-supply arrangements had been brought into force, notwithstanding that there was no reason in the first instance to condemn the water of the railway well, since it was used habitually by several thousands of people among whom the epidemic cholera was not more rife than among the general population of the city and suburbs; and second, that the move into camp had nothing to do with the cessation of the disease in the asylum, for the move was only made after the

ground had more or less dried up, whilst the second batch was moved out two days after the last case had occurred, and at a time when the disease had not only run its course in the asylum, but was also generally on the decline throughout the district, and the Lahore station itself, in which latter the last reported case occurred on the 26th October. The first batch of 175 harmless lunatics was moved into camp on the 3d October, after giving 23 of the total 27 cases that occurred, and after the water-test had failed. The second batch of 100 criminal lunatics was moved into camp on the 9th, that is, two days after the last of the 4 remaining cases of the 27 which they gave. There is no doubt, however, that the move into camp proved beneficial, for, at the least, it saved the lunatics from the exposures to damps and chills to which they were subjected in the wards of the asylum, with their open doorways and grated windows, and to the evil effects of over-ventilation at a season of heavy rainfall and variable temperature. It is strange how, in times of epidemic cholera, attention is diverted from these and other matters directly affecting the bodily welfare of the individual by a preoccupation of the mind with notions of water contagion, human communication, specific poison, germs, and so forth, to the complete exclusion of a calm and serious consideration of the actual health and bodily circumstances of the individual attacked by the disease.

But to resume the account of the outbreak in the Lahore Lunatic Asylum. After the failure of the water-test, it was then supposed that the dejecta of the stomach and bowels of the cholera patients "was one very obvious means by which the disease spread," for, falling on the floor, which was of rammed earth, "in the dry climate of the Punjab, the fluid would rapidly evaporate, leaving the surface quite dry, but coated with the colourless and odourless suspended matter. This matter would readily become diffused through the barrack in the form of fine dust, and would rarely fail to exercise its poisonous properties." I must here state, in reference to this assumed source of cholera propagation, that the sort of contamination of the floor above mentioned is what happens not only in every Native house, with rare exceptions, in which cholera cases occur, but also in their courts and alleys and surrounding fields and roadways, in their camp-grounds and sarais, and places of common resort, all over the country, year by year during every season of cholera prevalence. Yet, despite this widespread diffusion of the materials supposed to possess such "poisonous properties," cholera manifests itself only in its proper seasons, and in places different, very often, in one season from those affected in the preceding season; at least it is so in a very large proportion of instances, as is clearly shown by the mortuary statistics of successive years.

In the Lahore Central Jail there were altogether 26 cases and 14 deaths from cholera. The first case occurred on the 17th September, and the last on the 11th October; for the first nine days the disease was almost entirely confined to patients in hospital, and in that space of time 16 of the total number of cases had occurred. It was supposed that the milk supplied to hospital patients and the curds supplied to other prisoners twice a week might be the cause of communicating the disease; the issue of both was stopped on the 28th September, and thereafter only 2 fresh cases occurred. This coincidence, as is very aptly observed by Dr. De Renzy, "may be merely accidental."

The rainfall at Lahore and the cholera mortality registered in the district are shown by months in the subjoined statement. It will be observed that, as is shown in the case of Amritsar on a preceding page, the first half of the

year is characterised by marked drought and absence of epidemic cholera, while the prominent feature of the last half is an abundant rainfall and much activity of epidemic cholera.

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1875.	Rainfall.	0·00	2·10	0·00	0·00	1·00	0·90	3·20	14·50	9·70	1·30	0·00	0·50	33·20
	Cholera.	...	...	1	1	1	1	1	12	177	82	12	...	288

Sialkot.—In this district a total of 294 cholera deaths was registered; of these 1 was in January, 74 were in September, 216 in October, and 3 in November. Altogether 23 places recorded cholera out of a total of 2315 places in the district; of these 13 collectively registered 273 deaths and 10 others 21. The largest number of deaths, 110, all in October, occurred in the town of Pasrur, population 8527, the first on the 2d, the last on the 24th of the month, and there were altogether 202 seizures. The next highest number of deaths, 26, was returned by each of the two places, viz., Baddoki, population 1273, all in October; and Nárowál, population 4727, in September 24 and October 2; Jasar, population 2147, returned 21 deaths, all in October; and so with others. The first case of the disease reported in this district occurred on the 1st September in the civil station of Sialkot, and it was the only case reported in that station throughout the year, though 2 detached cases were reported in Sialkot city during October. From the Sialkot district cholera appears to have advanced into the adjoining Kashmir territory of Jammu, but of the prevalence of the disease in that part of the country there is no information. The disease is supposed to have been prevalent in the country about Jammu towards the close of the year, and it is said that its existence was concealed until after the visit of His Royal Highness the Prince of Wales in January 1876.

The rainfall of 1875 was the heaviest of any year in the series of twenty with which this history deals, and was nearest approached by the fall in 1863. The rainfall in 1875 was 35.90 inches, or $8\frac{1}{2}$ inches above the average, and about $9\frac{8}{10}$ inches more than the fall in the preceding year. Its seasonal and territorial distribution also was very unusual. The falls in the first and second quarters of the year were both much below the average; that of the first by over 1 inch, and that of the second by fully 2 inches, thus producing a long period of more or less drought during the first half of the year. In the third and fourth quarters the falls were above the average in both, but pre-eminently so in the third quarter; the excess in the third quarter was by $11\frac{1}{2}$ inches, and in the fourth by one-third of an inch. In its territorial distribution the rainfall was comparatively much heavier in the eastern portion of the province up to the Lahore division inclusive than in the western portion. The total amount of rainfall measured at the 32 stations in the province (see Table No. VI.) was 1148.88 inches; of this amount only 278.31 inches were contributed by the 14 western stations from Rawal Pindi to Kohat, and 870.57 inches by the 18 eastern stations from Delhi to Ferozepore. If from the eastern districts we exclude the hill-stations of Kangra, with its rainfall of 156.80 inches, and Simla, with its 91.39 inches, the total rainfall in the 16 other eastern districts will be 622.38 inches, against 278.31 inches in the 14 western districts. In the preceding year the total rainfall measured at the 32 stations was 835.86 inches; of this amount 256.57 inches were contributed by the 14 western stations, and 579.29 by the 18 eastern stations, or, excluding Kangra (158.60 inches) and Simla (56.49 inches), 364.29 inches by the other 16 eastern stations. Thus the total rainfall was 278.31 and 256.57 inches in 1875 and 1874 respectively in the 14 western districts,

against 622.38 and 364.29 inches respectively in the 16 eastern districts. The deficient rainfall in the western half of the province was attended by absence of epidemic cholera in that area; the excessive rainfall in the eastern half, following as it did upon a prolonged season of drought, was attended by considerable activity of epidemic cholera, and, moreover, this activity was to a very great extent checked and kept within bounds by the excessive amount of the rainfall in the eastern area, which there supersaturated, as it were, both soil and air with moisture, and thus to a greater or less extent limited the free play of evaporation during the latter half of the year.

The monthly average rainfall and the monthly cholera mortality registered for the province as a whole are shown together in the subjoined tabular form:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1875.	Rainfall.	0·24	2·14	0·37	0·04	1·23	1·20	8·26	10·52	10·15	0·78	0·32	0·65	35·90
	Cholera.	4	4	4	10	41	316	747	1,515	2,117	1,358	129	1	6,246

This statement, like the similar ones on preceding pages, well illustrates the relation I have so frequently shown to exist between epidemic cholera prevalence and the rainfall in respect to its character and effects upon the soil, and requires no further explanation in this place.

The food-supply of 1875 was abundant and cheap. The average price of wheat was 24.96 sers the rupee against 20.78 sers the rupee in the preceding year. To this cheapness of food, and to the peculiar nature of the rainfall—its excessive amount in the third quarter of the year—is to be attributed the mildness with which the cholera epidemic of this cycle commenced its course in the first year of its triennial career.

1876.—In this year, the second of the cycle, cholera prevailed with somewhat less epidemic intensity than in the preceding year, in which, as has been explained before, the normal initial activity of the cyclic cholera epidemic was to a great extent checked and suppressed by the peculiar character of the rainfall in respect to its seasonal and territorial distribution. In 1876 the cholera death-rate among the troops and jails together was 2.74 per mille of strength, and among the civil population 0.33 per mille. This mild prevalence of the disease, which was in the normal course for the second year of the cycle, was coincident with an unusually abundant food-supply and almost altogether exceptionally cheap prices, and with a greatly diminished rainfall as compared with that of the preceding year, though it was still somewhat above the average, and also irregularly distributed as to season and territory.

The incidence of cholera in 1876 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

Among the civil population of the province, the mortality registered from cholera is shown by districts in Table No. I., and by months in Table No. II. The returns in the first show that the cholera of 1876 was confined almost wholly to the districts to the westward of Lahore and that district itself. This is exactly the reverse of what occurred in the preceding year, when cholera was even more wholly confined to the districts to the eastward of Lahore as well as to that district itself. This noteworthy distribution of the epidemic cholera of these two years is clearly shown in Table No. I. In 1875 every one of the districts to the eastward of Lahore inclusive was epidemically affected by cholera, and one or two deaths occurred in most of the districts to the westward. In 1876, though the disease was mainly prevalent in the country to the westward of Lahore inclusive, it did not affect

all the districts, and affected some only very mildly. Thus Ferozepore and Muzaffargarh returned no deaths at all from the disease throughout the year; Jhang returned only 3, Dera Ghazi Khan only 5, and Montgomery only a single death; from Mooltan the number was 32, and from Kohat 24; all the other districts in this quarter were about equally affected by the general epidemic influence. The district of Sialkot, directly adjoining that of Lahore to the northward, was affected in both years, and with considerably greater mortality in the later than in the earlier year. In the districts to the eastward of Lahore the general exemption from the epidemic cholera of 1876 was not quite so marked as was that of the districts to the westward of the same point in 1875. The districts of Amritsar and Gurdaspur returned 30 and 14 deaths respectively; Rohtak and Gurgaon 17 and 13; Hissar, Simla, Jullundur, and Hoshiarpur returned no cholera mortality whatever throughout the year; the other districts in this quarter returned only 1 or 2 deaths each, and Umballa 7. This marked division of the province between the epidemics of the two consecutive years is noteworthy as being a very exceptional occurrence so far as our statistics go, and, as will be seen in the sequel, it was strictly in accordance with the distribution of the rainfall in these two years. In both the years compared Ferozepore enjoyed a complete immunity from the epidemic, only a single cholera death being recorded in 1875, and none at all in 1876. In Lahore, the adjoining district to the north-west across the Sutlej, the disease was actively epidemic in both years, and much more so in the later, the mortality in 1876 being represented by 722 deaths registered, or nearly 2½ times greater than that of the preceding year.

In both years, as shown in Table No. II., the seasonal prevalence of the disease was identical in its rise and fall in May and November respectively; but in the second year the maximum of fatality was attained earlier and continued longer than in the first, in July instead of August; the autumnal abatement, however, commenced in both years in October, but was somewhat more rapid in the first than in the second year. The records of the two years compared show that the cholera of 1875 was, so far as this province is concerned, confined wholly as an epidemic cholera to the districts situate to the eastward of the River Ravi and the one district of Sialkot to the westward of that river, and that likewise the epidemic cholera of 1876 was wholly confined to the districts to the westward of the Ravi and the one district of Lahore to the eastward of that river. This peculiar distribution of the epidemic prevalence of cholera in these two years is shown by the records of the preceding and succeeding years to be quite an exceptional circumstance in the deportment of cholera in this province. In connection with this observed peculiarity, the following particulars are from the account of the epidemic recorded in the "Sanitary Report for the Punjab for 1876," by myself, who in July of that year entered upon the duties of Sanitary Commissioner for the Punjab.

"The furthest point westward reached by the cholera epidemic of 1875 in this province was the district of Sialkot. Here the epidemic, gradually spreading north-westward from Delhi, where it broke out in the middle of May, first made its appearance in the week ending the 11th September. It continued till the week ending 13th November, reached its maximum in the week ending 9th October, and caused a total registered mortality of 293 in 23 towns and villages scattered about in different parts of the district."

From Sialkot the disease advanced into the adjacent Native State of Jammu and Kashmir, and was prevailing there epidemically in December

1875. The first case in Srinagar, the capital of Kashmir, "it appears, occurred on the 29th December 1875, and was supposed to have been imported from Jammu." The medical officer in the service of His Highness the Maharaja reported to the British Resident in Kashmir that "the disease commenced in the depth of winter with a heavy fall of snow." Comparing the present with the last preceding cholera epidemic which occurred in 1872, he writes—

"The present outbreak, although equally widespread, is not yet so severe, that is, it does not prevail to such an extent as it did on the last occasion. But the type of the disease is equally virulent; its fatal character remains unchanged. There is not the slightest doubt about the true nature of the disease. It is malignant cholera, with all its characteristic features."

And Surgeon-Major J. C. Morice, British medical officer on duty in Kashmir, reported—

"There is no doubt whatever as to the type and character of the disease. It is true cholera, with all the most fatal symptoms, viz., collapse, sunken features, cold tongue, husky voice, suppression of urine, cold wet skin, and great restlessness strongly marked."

In his "Sanitary Report for the Punjab for 1875" Dr. De Renzy, the Sanitary Commissioner, writes—"In connection with the Sialkot epidemic it ought to be stated that the disease spread to the adjacent Native State of Jammu, but the existence of the disease was concealed until after the visit of His Royal Highness the Prince of Wales. I have been informed from several private sources that the disease was very prevalent during His Royal Highness's stay at Jammu (20th January 1876)." Major P. D. Henderson, the Resident in Kashmir, reporting to the Government of the Punjab, wrote—"Immediately after His Royal Highness's departure cholera broke out at Jammu."

Thus we have evidence of the prevalence of cholera in Kashmir and Jammu at the close of 1875 and opening of 1876. Of the progress of the disease during the following months of February and March we have no particulars. It is probable that, as is usual with cholera during these months, the disease had subsided to a minimum of prevalence before the usual renewal of activity in April. It appears from the accounts received that the cholera of 1876 did renew its activity in Kashmir in April. The British Resident, reporting to the Government of the Punjab on the 15th April 1876, states that on the preceding day he had received further information from the Governor of Kashmir regarding the progress of the disease, and writes—

"From his letter it appears that in the town of Srinagar 5 deaths from cholera are said to have taken place up to the 7th instant. On that date there were 13 seizures reported, 5 of which terminated fatally. On the 8th instant there were 4 seizures; number of deaths not stated. The disease, I regret to learn, has made its appearance in the districts as well as in the capital, and it is said that up to the 7th instant 121 deaths from this cause have taken place in the five wazirats or districts into which Kashmir is divided. It appears to be a bad feature in the present outbreak that the disease has appeared in all parts of the valley almost simultaneously. . . . It is said to be a feature of the present outbreak that the number of seizures has been greater during the prevalence of cold and wet weather. There has been a good deal of rain all over Kashmir till within the last three or four days, and at present there seems to be a prospect of the continuance of fine weather."

From the official returns furnished to Dr. Morice it appears that there were in all 850 cholera deaths in the city of Srinagar between the 29th December 1875 and 24th May 1876, besides 905 in the districts and 87 among the Maharaja's troops; total 1842. After the 24th May the disease seems to have there sensibly declined, and the city returns for the week ending 30th

June show only 5 seizures with 3 deaths, though the total of the previous week's returns, after an apparent interval of freedom, commence again from the 17th July, and up to the 16th October show a total of 2559 seizures with 1224 deaths. The return for the last week, from 10th to 16th October, shows 142 seizures and 52 deaths. How long the disease continued before it finally ceased in Srinagar or in the Kashmir territory is not known. It is clear from what has been recorded that the cholera of 1876 was prevailing in Kashmir as an epidemic up to the middle of October of that year.

Regarding the course of the disease in Jammu, it would appear that, after an epidemic prevalence in December 1875 and January 1876, cholera subsided into quiescence during February and March, and continued in abeyance until its reappearance in an epidemic form in July. The rainfall at Jammu in July is stated to have been "more abundant and protracted than it has been for twenty years at least." It is also recorded "that shortly after its commencement diarrhœa became prevalent, and every one complained more or less of indigestion and derangement of the bowels. The diarrhœa became more frequent and severe, and eventually assumed a choleraic character. The first decided case of cholera occurred on the 4th August, and the epidemic reached its maximum of intensity about the middle of the month. The disease was not at any time localised in any particular district of the city. . . . The great and sudden diminution of new seizures on the 23d was contemporaneous with a change of wind from east to west, and a change in the condition of the atmosphere quite appreciable to the senses as observed at Sialkot." From the reports furnished it appears that during the twenty-nine days from 4th August to the 1st September there were registered in the city of Jammu 605 seizures and 250 deaths from cholera. The highest number of seizures in any one day occurred on the 17th August, when 56 were registered; and the highest number of deaths, viz., 22, occurred on the 19th August.

With this brief account of the cholera of 1875–76 in Kashmir territory, I proceed to trace the progress of the disease in the Punjab, taking the districts in the chronological order of the first cases reported from them.

Jhelum.—The first case of cholera reported in this district occurred on the 12th June in the town of Jhelum, and 4 deaths were registered there during the month, none in July, 5 in August, and 4 in September; total 13. Altogether 51 places recorded cholera in this district, of which 19, returning 5 or more deaths each, registered together 249, and 32 others 52; total 301 deaths. The monthly distribution of rainfall and cholera mortality during the years 1875 and 1876 are shown in the subjoined statement for the purpose of comparison:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall.	0·80	0·60	0·50	0·00	0·70	0·20	6·70	11·10	5·80	0·70	0·50	0·70	28·30
	Cholera.	...	...	...	...	1	...	...	...	...	...	...	...	1
1876.	Rainfall.	0·70	1·40	1·60	1·60	1·70	1·80	4·70	3·90	0·80	1·40	0·60	0·00	20·20
	Cholera.	...	...	...	...	...	40	42	132	63	24	...	...	301

Here we see in 1875 light showers in all the months up to June inclusive, excepting only April, in which month no rain fell, and then heavy falls in the next three months, sufficient to saturate the previously damped soil and air with moisture; and with these conditions there was no cholera, except a single death in May with the light showers following the drought in April. In 1876 we find heavier falls in all the first six months, and with an equality of distribution preventing any disturbance of equilibrium in the direction of drought; and with these conditions an absence of cholera until June, the hottest month of the year, when, with the more active evaporation from a well-damped soil, cholera commenced epidemic activity. The deficient rainfall in the succeeding months was insufficient to saturate the soil and air with moisture, and only added fresh material for more active evaporation; and under these conditions the epidemic cholera ran its course unhindered.

Shahpur.—The first cholera death was on the 13th June, in the town of Khushab, close on the right bank of the River Jhelum; the disease spread rapidly through the town, and caused 63 deaths in June and 17 in July, and no more. "The first case was a nát, or gipsy, who was one of a party of twenty who had been engaged to perform athletic tricks to enliven a marriage feast. He had over-eaten, and suffered from surfeit on the 12th, and had become collapsed on the 13th June, after purging and vomiting." The second sufferer was a girl who lived near the scene of the feast; but the third sufferer was a "saidâni who lived in another quarter of the town, and no communication could be traced between her and the other cases." These 3 cases occurred on successive days, the 12th, 13th, and 14th, and the 2 first died on the 13th June. No fresh case occurred for four days, then on the 18th and 19th June 3 fresh cases occurred. "The first of these was the wife of a constable who had been overlooking the sweepers on the previous day, and one of the others, on the 19th June, was a boatman from a boat which had come down from Jhelum town and moored at the Khushab ghât." Fresh cases continued to occur, and on the 25th June there were 24 seizures with 7 deaths. The disease after this declined, but lasted till the 9th July; total seizures 157, deaths 80.

In Shahpur town, on the opposite side of the river and 8 miles distant from Khushab, the first case of cholera was observed on the 17th June; the sufferer was a vegetable vendor who had gone to Khushab on the previous day for a load of melons. The disease then spread, and there were altogether 11 seizures and 6 deaths in eighteen days. "The last case occurred after an interval of six days, and in his house was found a stock of newly gathered melons." Three other cases cropped up in the station on the 20th and 22d June and 6th July. Two of these were petitioners at the magistrates' court, who were taken ill under trees, and the third occurred in the station bazar. In the jail there occurred 12 seizures with 2 deaths over a period of thirty-five days; there was an interval of sixteen days between the first case on the 21st June and the second on the 7th July, on which day 2 new seizures occurred. The first case was a prisoner working in a solitary cell; he had not been outside the jail for sixty days. Of the 2 next cases, 1 belonged to a gang of 13 sessions prisoners lodged together in one barrack, and the other was a patient in the hospital ward from guinea-worm; the former had not been outside the jail for twenty-four days, and the latter for fifty-six days. During the interval of sixteen days between the first case and the two next new prisoners were not received inside the jail, but were lodged outside.

"The temperature at the time of the appearance of cholera was unusually high, 101° at 10 A.M. and 106° at 4 P.M. inside a room, with hot duststorms frequently. On the

19th June a rain-current came up from the south-west, which gave rain 1.80 inches and caused a fall in the temperature to 94° and 97° for nearly a week. Towards the end of June the weather again warmed up, and reached the previous high temperature—101° and 104°—for the unexampled length of fourteen days. Night afforded no relief, and the thermometer marked 98° outside at midnight. So prolonged a visitation of high temperature was almost unknown in this latitude, especially following so closely upon the previous rain-current in June. On the 9th July there came another rain-current from the north-east, and the terrible heat abated. The temperature during the remainder of July was seasonable after 3.06 inches of rain had fallen."

It is stated that—

"No impression seemed to be made on the epidemic by the meteorological changes above noted. It began in a period of unusually high temperature, with duststorms; it extended to fourteen places during the prevalence of the rain-current in June, to fifteen more places during the succeeding great heats; it then spread to six places during the influence of the rain-current in July, and died out at the end of the month. Before the second rain-current appeared the disease had spread from Khushab 36 miles northward, into the Sind Valley of the Salt Range, and 15 miles westward to Mitha Towana on the highroad to Bannu and Dera Ismail Khan. Later it extended to 30 miles south-west, and 30 miles westward to the borders of the adjoining districts, where it appeared."

But, under the views expounded in preceding pages of this history regarding the relation of epidemic cholera prevalence to rainfall in respect to its effects upon the soil, this activity of epidemic cholera in the Shahpur district is quite intelligible. In this district, from the commencement of the epidemic in June to its termination in September, altogether 60 places recorded cholera, of which 24, returning 5 or more deaths each, together registered 445, and 36 others together 59; total 504 deaths. In the subjoined statement are shown contrasted the monthly rainfall and cholera mortality for the years 1875 and 1876.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall .	0·00	1·70	0·10	0·00	0·60	0·60	1·90	0·90	3·70	0·00	0·80	0·70	11·00
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1876.	Rainfall .	0·20	0·90	1·60	1·20	0·90	1·80	3·10	3·90	0·20	1·40	0·80	0·00	16·00
	Cholera .	...	...	...	...	...	157	291	41	15	...	...	...	504

Here we find in 1875 a period of more or less drought throughout the year, except in September, when the rainfall itself was of small amount and occurred at a season when the temperature was much on the decline, and a complete absence of cholera. In 1876 we find comparatively copious showers during the first six months, and epidemic cholera commencing in June, with a light rainfall in the hottest month of the year, and running its course through the succeeding months with rainfall sufficient to give play to active evaporation of moisture from the surface of the soil.

Lahore.—In this district isolated deaths from cholera were registered, in January 2, in February 2, and in April 2; of these last, 1 in the city of Lahore on the 15th April. The next cholera death in Lahore was on the 15th June, in the Anarkali bazar, near the police-station; some "doubtful" cases, however, were reported as early as the 2d June, but on inquiry they were found to be either cases of fever or choleraic diarrhœa. From the 15th to the 22d June 7 cases of cholera occurred, all, excepting 1 which

occurred in the city, in Anarkali, near the police-station. The first case, on the 15th June, was a stranger from Akalgarh, where no cholera is reported to have occurred, and he died the same day. The second case, also on the 15th June, was that of a Bengali lad residing in Anarkali. A man who attended the first case was himself attacked with cholera three days after the other's death, and died on the 22d; a young man who attended the second case was himself taken ill on the 17th, and died the same day. These were the only two instances in "which the intercommunication of the disease was noticed in a remarkable manner." From the 22d June no fresh case of cholera was reported till the 15th July, when a washerwoman was seized with the disease near the police-station in Anarkali, and died the same day. The next case reported was on the 18th, and the third on the 21st. After the lapse of a week 3 cases suddenly occurred on the 28th July in the sweepers' quarter in Anarkali; all 3 fatal the same day. An interval of three days passed, and 2 fresh cases were reported, 1 occurring in the sweepers' quarter and the other on the roadside. Another interval of three days passed, and then another roadside case was found by the police. Next day, 7th August, 5 cases occurred in different parts, viz., Anarkali, Sultan Sarai, and the European quarters; and of these only 1 recovered. On the 11th August 6 cases and 4 deaths were reported, 2 in the city and the rest in Anarkali. On the 12th there were 5 cases, all fatal; on the 13th, 1 case, also fatal; on the 14th there were 8 cases with 3 deaths; on the 15th, 9 cases with 7 deaths. In this way the disease went on progressing, but the daily number of seizures never rose above 9 or 10. From the 1st September the disease began to decline, and by the 16th it had totally disappeared from the Anarkali quarter.

"The cases, with the exception of very few, were not virulent in type. In most of them a history of previous indigestion, caused by eating cucumbers, &c., or bowel-complaint, was noticed. The subjects of this malady have been from the lower classes—people whose living was poor, and who had to submit to what came before them; cucumbers, melons, &c., being cheaper than any other kind of food, were generally used in their meals. There have been cases also among the middle and higher classes of people. In these, with a few exceptions, I have noticed the disease attacking the men who had been intemperate in their habits or debilitated by any constitutional disorder. The only meteorological phenomenon noticed in connection with this disease was, that rain apparently seemed to increase the affection." (From the Report by the Assistant Surgeon, Lahore.)

Altogether 722 cholera deaths were registered in this district and in 130 towns and villages; 35 places, returning 5 or more deaths each, together registered 561, and 95 other places 161. The highest number of deaths, 69, was returned by Kasur, population 16,793. In Lahore city the total deaths were 30, and in Anarkali suburb 12. In the subjoined statement are shown the monthly rainfall and cholera mortality for the years 1875 and 1876:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall .	0·00	2·10	0·00	0·00	1·00	0·90	3·20	14·50	9·70	1·30	0·00	0·50	33·20
	Cholera .	...	...	1	1	1	1	1	12	177	82	12	...	288
1876.	Rainfall .	0·00	0·00	0·90	0·60	0·30	0·70	14·50	1·90	1·50	1·10	0·00	0·00	21·50
	Cholera .	2	2	...	2	...	2	119	474	117	4	...	...	722

This statement speaks for itself, and needs no explanation after the numerous illustrations already analysed.

Gujrat.—The first cholera death registered in this district was on the 23d June, in the town of Dingah, population 5086. It was followed by 14 in July and 50 in August, and then no more. In this month no other place reported cholera except one village of those returning less than 5 deaths in the year. In July 39 deaths were registered in 9 new places. In August 128 deaths were registered in 23 other places, and so on. Altogether 77 places recorded cholera, of which 22, returning 5 or more deaths each, together registered 484, and 55 other places 88; total 572 deaths. The town of Gujrat, population 17,401, returned altogether 160 deaths, viz., 84 in August and 76 in September. The monthly rainfall and cholera mortality of this district in the years 1875 and 1876 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·20	1·40	0.20	0·00	0·90	0·90	7·40	12·00	6·00	1·10	0·30	0·90	31·30
	Cholera	...	...	...	1	...	...	...	...	1	...	...	...	2
1876.	Rainfall	0·60	1·30	3·30	2·80	2·00	0.70	23·30	5·00	0·00	3·10	0·20	0·00	42·30
	Cholera	...	...	...	...	...	2	53	191	283	43	...	...	...

Observe here the increased activity of the cholera of 1876 in September with the drying up of the previously soaked soil in a rainless month, and the decline of the disease with the heavy fall in October. The rainfall is for the station of Gujrat; the cholera deaths are for the district. But, as stated above, the cholera deaths in Gujrat town were 84 in August and 76 in September, and no more during the year; that is, the epidemic here broke out during the evaporation of the heavy rainfall of July, under the light fall in August.

Bannu.—The first cholera death was reported on the 4th July from Swas, population 1848, on the east bank of the Indus; 192 deaths were registered in this village, all in July. Altogether 166 places in this district recorded cholera, and the total of deaths registered was 998. Of the places returning 5 or more deaths each, 28 together registered 756, and of those returning less than 5 deaths each, 138 together registered 242. The largest number of deaths was returned by Swas, 192; the next largest number, 89, by Nammal, population 5018; the next, 66, by Musakhel, population 4603; the next, 60, by Isakhel, and so on. Regarding the first appearance of the disease in Swas the following particulars are recorded:—"The village of Swas, or Sawalas, contains 328 houses and 1774 inhabitants, is situated on the lowest slope of the hills on the western face of the Salt Range, about 17 miles south of Kalabágh, and has its water-supply from a beautiful spring which issues from the hills about a mile above the village, and is carried down close to the houses in a small stone channel. On the 3d July, and for some days previously, there was a large concourse of strangers from the adjoining villages, and from the Jhelum and Shahpur districts, assembled in Swas to witness a religious disputation between a man of that village and another of Piplán. While the Swas people were entertaining the strangers

handsomely with sheep, goats, &c., suddenly, on the 3d July, two of the strangers died of cholera, and several others were attacked. The first man who died was a Muhammadan who had come from Chakki, in the Jhelum district, to take part in the controversy. About the 3d July the weather was dry and extremely hot, and had been so for a fortnight previous. As soon as the cholera made its appearance in Swas the strangers there assembled ran away; and it is a remarkable fact that wherever cases of cholera subsequently occurred in the surrounding villages it was found that some one had been present at the Swas gathering. From the 6th July upwards sporadic cases occurred in several of the surrounding villages, but the disease did not there assume a virulent type. . . . There were cases of cholera occurring all over the country during the month of July, but the disease did not become very formidable, except in the few villages referred to specially and above mentioned." A quarantine was established on the Indus on the 11th July.

"The people of the villages about Swas were quite alive to the necessity of self-help, and they prevented all intercourse between themselves and Swas. No cholera-sheds were erected or other means used to segregate the cholera patients in the infected villages. The people manifested the utmost dislike, even horror, at the thought of their being taken away from their relatives and houses, and rather than go to the sheds they would have died quietly without allowing it to be known that they were ill."

As far as could be learnt, there had been no such outbreak of cholera in this district since Sikh times. "The people of Swas, the old men among them, recollect cholera in their village in Ranjit Singh's time, but far less severe than on the present occasion. It is noted that "the disease disappeared from Swas about the latter part of July simultaneously with the first heavy fall of rain, and then a number of those who were recovering from the attacks of cholera died of a disease known in this part of the country as *malli baruri*. It is a peculiarly fatal malady." Mr. Jenkyns, the Assistant Commissioner, mentions having seen several cases of it at all seasons.

"It manifested itself by a boil or pimple, or by several such, on any part of the body. The patient generally dies in one day from the appearance of the boil. About a dozen people died in Swas from this disease in the course of a few days after the cholera subsided. The people greatly dreaded this *malli baruri;* very few recover from it."

Dr. Bookey, the officiating civil surgeon of the district at the time of this outbreak of cholera, saw some of the Natives who were suffering from the malady above referred to, and reported that—

"They were covered with patches of a dark colour from 3 inches in diameter to about an inch. Their edges ended somewhat abruptly at the healthy skin, which was reddened for some distance round. They were elevated, hard, and dry, and some of them had cracks like those seen in mud when dried in the sun. The patients in all these cases were reduced to an extreme state of prostration, and appeared to be in great agony. The disease appeared to be a local death of all the tissues, probably due to a plugging of the vessels supplying the part."

In Kalabágh cholera did not appear till the 21st August, and in the station of Bannu (Edwardesabad) itself not till the 6th October. At Edwardesabad the first cases were those of a boy who had been eating raw maize cobs, and of a Native groom of the 6th Punjab Cavalry; 2 other cases were brought to hospital on the 8th October, and 4 on the 9th, and after that date other cases occurred all over the station, the native city being apparently free at this time, but it suffered later on. The first case in the jail occurred at 9 P.M. on the 13th October, and during the night and early morning 3 more prisoners were affected. These 3 cases occurred in different barracks and different gangs. Altogether there were 54 cases with 31 deaths in

cantonments, 71 cases with 30 deaths in the Native city, and many more in the numerous villages about. In the beginning of October the disease was reported as prevalent in the Waziri Hills, beyond the border, but of its course there and onwards into Kabul nothing definite is known. The progress of the disease in the Bannu district appears to have been somewhat remarkable. Cholera was first observed early in July in the Mianwali circle, and during that month affected more or less all the villages on the east bank of the Indus, and then appeared to die out. After the district had been apparently clear of the disease for a fortnight, it appeared on the west bank of the Indus at Kalabágh, and travelled to within 10 miles of Isakhel, and then again apparently died out. After the lapse of another fortnight the disease appears to have come from the hills on the west beyond the border, and appeared simultaneously at Bannu and Lakki, 32 miles distant, and between the 9th and 18th October was general in the cantonment and city of Bannu and the neighbouring villages to the west. In many of the cases of cholera the premonitory diarrhœa appears to have been brought on by eating the unripe ears of Indian corn or maize. The civil surgeon was of opinion that the cases in the jail were partly due to a similar cause.

"The 4 cases that occurred there, with 3 or 4 cases of diarrhœa, occurred during the night of the 13th, and on that day a fresh supply of maize-flour had been received and issued for the evening meal. The issue of this was stopped at once before the morning meal had been distributed, and not a single case of diarrhœa occurred afterwards, although cholera and diarrhœa continued to prevail in the city and cantonment, and the jail is situated between the two."

The monthly rainfall and cholera mortality in this district for the years 1875 and 1876 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall .	0·00	3·00	1·20	0·00	0·20	0·40	3·40	2·30	3·90	0·10	0·50	1·20	16·20
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1876.	Rainfall .	0·60	0·60	3·00	0·40	0·30	1·00	2·70	2·10	0·80	0·30	0·20	0·20	12·20
	Cholera .	...	...	...	...	...	...	463	47	18	375	95	...	998

Here, comparing the rainfall in the latter half of the two years respectively, we find that, with the diminished falls in 1876 and the freer play of evaporation from the surface of the soil, cholera prevailed with epidemic activity.

Rawal Pindi.—Altogether 142 places in this district recorded cholera, of which 16 of those returning 5 or more deaths each together registered 414, and 126 others together 212. The largest number of deaths, 198, was returned by the town of Rawal Pindi, population 20,802; the next largest number, 107, by Murree Sanitarium, population 10,605. The first case of cholera observed in this district was at Murree on the 13th July; the next place reporting the disease was Rawal Pindi, on the 19th July; after this numerous places around each of these stations reported the presence of the disease.

Regarding the outbreak at Murree, the following particulars are from the

"Sanitary Report for the Punjab for 1876," by myself as Sanitary Commissioner for the Punjab. "The Murree Sanitarium was established in 1851. Its elevation above the sea ranges from 7000 to 7500 feet. Its population, according to the census taken on the 22d July 1869, was about 10,605, namely, Europeans 1600, of whom 951 were males and 649 females; and Natives 9005, of whom 7820 were males and 1185 females. The Europeans were accommodated in 165 houses, and the Natives in 435, exclusive of the servants' huts attached to European houses. The same figures may be taken as fairly representing the population of the station in 1876 during the 'season,' or from April to October. The station is admirably drained by natural channels on the steep slopes of the hills, is thickly covered with forest trees and brushwood, and has numerous springs of water, which is more or less of 'hard quality,' and varies in quantity according to the season. The principal springs in the cantonment limits are now efficiently protected from impurity, and are used solely for the purposes of drinking and cooking. The average rainfall for the summer months is estimated at 35 inches, and the mean temperature for the same period, from May to October, is about 65.5°. The conservancy of the station has been improved year by year, and now, since the destruction of the bazar by fire last year, is in a more satisfactory condition in respect to that portion of the station than it has ever been."

Many of the springs, the water of which is collected into tanks in different parts of the station for the water-supply of the civil population, were still most inefficiently protected from sources of pollution, and the sewerage arrangements were still very defective. "The vegetation within the limits of the station is much too dense and rank; it obstructs the free circulation of air, and intensifies and prolongs the moisture of the atmosphere about the station. Notwithstanding these defects, however, the station is greatly improved in its sanitary condition as compared with previous years."

Since its occupation in 1851 Murree has been visited by no less than four destructive epidemics of cholera. The *first* was in 1858, when, after a course in Kashmir, Jhelum, Rawal Pindi, and Hazara, the disease was first observed at Murree on the 29th June, on which date a European soldier in the depot hospital died five hours after the first symptoms set in. Another fatal case occurred on the next day, and then no other till the 11th July, from which date to the 14th there was 1 case daily, and on the next three days, to the 17th, there was a sudden increase, with 16 deaths in the three days. From the 17th to the 29th July the disease declined, and there were 9 deaths in the interval. In these thirty-one days there were 42 cases and 31 deaths among soldiers in the depot, besides a woman and a child, who also died. On the 5th August a fresh fatal case occurred, and on the 10th another, and these appear to have been the last cases among the European troops, strength 254. The total deaths, including those of the woman and child, were 35.

"The disease was of the most virulent type, and in the majority death occurred in five to seven hours after first seizure. The first 3 cases occurred among the patients in the depot hospital, and most of the other cases occurred in one barrack in which the floor-planks were rotten and damp. This barrack, as also the hospital, stood close to a tank of stagnant water impregnated with decayed vegetable matter."

There is no record of the mortality among the civil population, European or Native, from this epidemic, but it is stated that "none of the European families were affected." Previous to the 14th July the weather was very sultry, but on that day heavy rain set in, and continued till the evening of

the 17th, after which the weather was fine, with occasional showers and thunder and lightning, with thick mists and fogs. The *second* was in 1867, the *third* in 1872, and each has been described in the review of its year. The *fourth* was in 1876, the year now under review.

The intervals between each of these epidemics at Murree have been successively nine, five, and four years. During the same period since 1851 there have been eight general epidemics of cholera in the Punjab, with the principal cities of which the station of Murree is in frequent communication during the summer months; they were those of 1856, 1862, 1865, 1876, 1869, 1872, 1875, and the year now under notice. With this brief reference to the previous visitations of cholera at Murree, I proceed to describe the epidemic of 1876 in that station.

On the receipt of intelligence that cholera was prevalent in Kashmir a quarantine was established at the Kohala bridge over the Jhelum on the 22d April, and all the ferries across the river within the limits of the Murree district were closed to all traffic whatever. The quarantine was strictly maintained up to the 19th July, when, five days after the appearance of cholera in Murree itself, it was removed. During the period the quarantine was in force a total of 1385 persons were detained at the Kohala bridge for a period of eight days each; excepting European travellers, and sometimes their servants, all passengers were detained for the quarantine. No single case of cholera occurred in any one of the eight camps in which the travellers were detained, nor in the two hospital camps, nor amongst the police guard or hospital establishment. With the exception of two mild cases of fever, which both recovered on the third day, and one suspicious case of diarrhœa, which occurred previous to the 31st May, there was no sickness amongst the travellers, nor were any of them treated in hospital. On the average fifteen persons were liberated daily and passed on towards Murree.

The first case of cholera observed in Murree was on the 13th July; the patient was a water-carrier employed, since the 1st April preceding, at Powell's Hotel, in the central part of the station below the Mall. He was a Kashmiri, and had not left the station since he took service at the hotel. He was taken ill at noon on the 13th July, and died at 1 P.M. the next day, shortly after being taken to the Charitable Dispensary. On the 15th the hotel proprietor's two daughters, aged 9 and 10 years respectively, were seized with cholera within a few hours of each other; they both died, one the same evening, the other the following evening. On the same day, 15th July, late in the evening, a Kashmiri, in service as a jhampani in the compound next to Powell's Hotel, was seized with cholera; he was carried away out of the station towards his home by his comrades the next morning. On the 16th another Kashmiri, in service as a jhampani with a family residing in the neighbourhood of the hotel, was seized with cholera; he died during the night of the 18th in the dispensary; this man had been three months in the station, and until the last few days preceding his illness had worked as a coolie at odd jobs; on the 11th he went on an errand to Kohala, and returned the next day feeling unwell; he had for some days been suffering from indigestion and pain in the belly. On the 17th, in the evening, another Kashmiri coolie was attacked; he died the next day in the dispensary. On the 18th there were 4 fresh cases with 2 deaths, all Kashmiri coolies. On the 23d the disease reached its climax with 22 seizures and 6 deaths during that day, all Natives, and mostly of the coolie class. On this day also the disease appeared among the Europeans in the depot, one woman and two children being seized, of whom one, a child two years of age, died after four hours' illness. On the 24th there were 8

seizures and 6 deaths in the depot, the deaths including the woman and child attacked the day before. These cases occurred in different parts of the depot, and were not confined to any single barrack. The disease was of a most malignant type, with little vomiting and purging and general absence of cramps, but a very rapid sinking into collapse, in which state the patient died in from seven to nine hours. On the 25th and 26th no fresh case occurred among the troops, but 2 deaths in each day entirely took away all those previously attacked. During these two days the troops were moved into camp on Topa Hill, about 3 miles from the depot. On the day after arrival there 3 fresh cases with 1 death occurred, and 1, 2, and 5 cases in each of the succeeding days, with 3, 2, and 2 deaths in each. From the 31st July no fresh case occurred, but 2 deaths on that day and 1 on the 1st August closed the list of casualties in this detachment. In these ten days 24 seizures and 22 deaths occurred among the Europeans of the depot. Among the civil population, European and Native, at the same time the disease prevailed with proportionate violence and frequency up to the 6th August, after which it rapidly declined, and ceased on the 18th August; the total numbers attacked were 9 Europeans, of whom 7 died, and 190 Natives, of whom 111 died.

For the first eight or ten days the disease was especially prevalent among the Kashmiri coolies, but it soon spread, and attacked Native servants and the European residents in different parts of the station. Most of the seizures, however, occurred in the western half of the station; only two or three seizures, among the Natives, were known to have occurred in the forest end of the station beyond the Post Office. The Murree Club and the houses near it, on the drainage-gully leading from the church to the Rawal Pindi cart-road, were more severely affected than any other part of the station. No less than 13 cases of cholera, 9 of which proved fatal, occurred among the domestics on the Club premises, besides the case of a military officer, who recovered, living in the Club quarters. An equal number of cases, including a European officer, who died, occurred in the curve of houses from the Commissariat mule-sheds round to the compound of "Lockwood." Most of these cases proved fatal. In the epidemic of 1872 the disease was for a time principally confined to this same part of the station, namely, "to the line of drainage which passes down from the church to the Rawal Pindi road."

Though the cholera of 1876 was recognised in Murree only on the 13th July, subsequent inquiry led to the discovery of several suspicious deaths registered under different heads in the mortuary returns. The earliest of these was recorded on the 22d May, under the head of "diarrhœa and vomiting." The sufferer was a Kabuli coolie, and was taken ill immediately after arrival at Murree from Rawal Pindi, and died the same day, shortly after being taken to the dispensary. The next suspicious death was registered on the 5th June, as from "fever after two days' illness, vomiting being one of the symptoms." The third was that of a religious mendicant, a native of Makhowál, in Shahpur district, whence he came to Murree by way of Rawal Pindi, where he halted five days; he arrived in Murree on the 27th June, and immediately on entering the station was seized with vomiting and purging on the road near the Commissariat Rum-godown, which is situated close to the Murree Club. He lay there all night, and next morning was carried in a dooly, by some friends who had heard of his distress, to a house near the police-station in the bazar, where he died at about 1 P.M. the same day, 28th June, with all the usual symptoms of cholera. Besides these there was another death which at the time was supposed to be from cholera, though

it was afterwards registered as from typhoid fever. The sufferer was the wife of a European tradesman in the station, who gave the following particulars of her death :—

"Mrs. F—— had usually good health, though latterly she complained occasionally of disordered liver. On the 5th June she complained of feeling unwell, the result of undue exposure to the sun at a picnic, but went about her usual duties without hindrance. On the 8th June she was suddenly taken ill with violent vomiting and slight purging, with pains in stomach and back, but no cramps; she went to bed at once, and died on the 10th June, never having rallied from the first, and hardly having spoken during her illness; her voice was altered, the extremities were cold, and the urine was rather suppressed. He states also that there were faintness and dryness of the throat, and the body, at first hot, became very cold till death; the eyes were sunken, and the face was pinched and blue."

It is further stated that one of deceased's daughters, aged about sixteen years, who happened to see Mr. Powell's children during their illness, immediately on returning home told her father that they were attacked by the same disease as that her mother, whom she had nursed, died of.

At the time the disease was first recognised at Murree nothing had been heard of its existence anywhere in the country between Murree and the River Jhelum, which separates this district from the Kashmir territory; but after the disease was established in epidemic activity in Murree hill-station many of the villages around reported cholera deaths. In a large proportion of these villages the first cases were in persons who had visited Murree, or some village where the disease had manifested its presence, within a few hours, or at most two days, of their being taken ill. Nothing was observed in the course of the epidemic to favour the notion of its spread by contagion. It rarely attacked those in the closest relations with its victims, but generally seized people independently of each other, and in widely separated localities. In the great majority of cases the persons attacked were either just returned from a visit to some other place, not always an affected place, or were travelling, or otherwise exposed to the inclemency of the weather under conditions of privation and fatigue; that is to say, they were subjected to long fasting, to cold and rain, and to the fatigue of long marches. Out of a total of forty-eight persons employed in the civil hospital establishment, and in more or less constant attendance on the sick, only one was seized with cholera; he was a water-carrier, and he died; only one of the establishment was seized with diarrhœa; he was a dooly-bearer, and he recovered. In the depot none of the attendants on the sick were attacked.

There were no grounds whatever for supposing that water contamination had anything to do with the origin or spread of the disease. The European soldiers in the depot suffered more severely than the civil community, yet the water they used was the purest and most carefully protected of any in the station. With respect to its general sanitation, Murree was in a better condition in 1876, both before and during this cholera outbreak, than it had ever been in previous years. Yet the epidemic of 1876 was of a more virulent and fatal character than any of its predecessors in this station. During the past few years much has been effected in Murree to lessen the sanitary defects surrounding its population, more especially in the very part of the station which suffered most severely in this last visitation of cholera. Leaky and overcrowded barracks had been repaired and enlarged accommodation provided, pools and puddles had been drained or filled up, and offal and filth of all sorts had been systematically and permanently removed away to a distance from the station, whilst the general conservancy arrangements of the whole place had been greatly improved. The water-supply had been to

a large extent protected from many former sources of pollution, and, so far as concerns the supply set apart for the use of the depot, was as pure as it issues from the spring.

"Yet with all these improvements in the commonly supposed sources of the disease, and the removal of the principal of its assigned causes, cholera is now none the less destructive than it was when all these sanitary measures, of themselves beneficial under any circumstances, were neglected. Indeed this last epidemic has been of a more virulent and fatal character than any of its predecessors in this station. Where, then, are we to look for the explanation of its origin? The weather, it seems, is the only factor in the production of cholera that has not changed its character at Murree, so far, at least, as concerns its connection with this disease, if we may form a judgment upon the record of past facts. The previous outbreaks of cholera at Murree have all been attended by much the same sort of weather, and have occurred at much about the same period of the year, that is, during the rainy season. On this last occasion, as on the previous occasions of the appearance of cholera at Murree, the weather during the whole course of the epidemic has been characterised by an oppressive, close, and sultry condition of the atmosphere, which has been more or less densely obscured by frequent mists and fogs; whilst unusually heavy rains, with occasional storms of thunder and lightning, but little or no wind, have occurred to make up the sum of the most apparent meteorological phenomena of the season. It seems that we require a more accurate knowledge than we at present possess of the actual conditions of the atmospheric elements as they prevail at the time of such epidemic outbreaks. We know nothing of the actual state of the air during such cholera visitations, of its temperature, humidity, barometric pressure, and electric condition, nor in what manner the just balance of their combinations during normal states may be altered during cholera seasons. A careful investigation of these points is of the utmost importance before we can hope to solve the mysteries that surround the causes and effects of cholera. For there is no doubt that the disease first makes its appearance among those who are most exposed to the atmospheric vicissitudes of the season, and who, either from their usual or some accidental condition of life, are least prepared to resist in their bodies any sudden and violent disturbance in the ordinary balance of the functions of the healthy system which may be produced by atmospheric influences, especially under circumstances of deficient or faulty clothing and food and habits of intemperance or other excess."

At the time that I recorded the above observations in connection with the epidemic cholera of 1876 at Murree (of which I was a personal witness throughout, and of which, after a tour of investigation through the Murree and Hazara Hills and the Rawal Pindi tracts during the progress of the epidemic, I wrote a detailed account, which was separately printed by the Punjab Government), and of which I see no reason yet to alter a single word, I was not in possession of the key with which subsequent experience and more extended information have furnished me—the key with some slight turns of which I have already in numerous preceding passages illustrated how the door to the mysteries of cholera may be opened, and by a full turn of which in a subsequent part of this work I hope to unlock that door and remove the veil of mystery which now enshrouds that disease and all connected with it. But to return to our subject of the moment.

As before stated, the first recognised case of cholera in the Rawal Pindi district occurred at Murree on the 13th July. The first recognised case outside the limits of Murree occurred on the 19th July at Rawal Pindi, 38 miles south-west of Murree, on the plain at the base of the hills. It was an isolated case, and the victim was a Kashmiri coolie, aged 25, a resident of the Punch district in Kashmir, who was taken ill on the evening of the 18th July at the village of Uryán, a few miles from Rawal Pindi on the road to Murree; being a stranger, he was carried next morning by the villagers to the city dispensary in a state of collapse, and there he died at noon the same day, after an illness of less than twenty-four hours. It was ascertained that this man had been detained at the quarantine camp at Kohala from the 12th to the 19th May, and was then passed through and registered as "going to Rawal Pindi." At Murree it was stated that he had been working there as a coolie for six weeks

or so, but the date of his departure could not be ascertained; it is not improbable that he was actually in that place when the first case of cholera was discovered there on the 13th July. However this may be, on the same day that he died of cholera at Rawal Pindi, the 19th July, 2 other cases of cholera occurred outside the limits of Murree station, both at the village of Dhirkot, near Kotli, on the River Jhelum, and about 22 miles east of Murree; both men had gone to Murree to sell fowls in the bazar; both were taken ill with cholera immediately on their return to their own village; one died within twenty-four hours, the other recovered. On the same day, 19th July, a man, aged 30, died of cholera after three days' illness at the village of Baghan, below the Kalabágh camp, and about 23 miles north-west of Murree; he had not left his home for some days prior to being seized, nor was there any trace of his having come in contact with anybody from Murree. On the 21st July 2 deaths from cholera occurred at Dewal, 10 miles from Murree on the road to Kashmir; in both cases the sufferers had been carried out the same day, ill with the disease, from Murree. No cases were recorded on the 20th, 22d, or 23d, but on the 24th July 7 deaths were registered in different localities around Murree and on the road to Rawal Pindi, all fugitives or return visitors from Murree. Fresh cases occurred from day to day, and in different localities, and on the 30th July the first case occurred at Bakot, a village 20 miles from Murree, and above the site of the Kohala quarantine camp.

At Rawal Pindi, following the case of the 19th July, there was another fatal case on the 23d, a policeman who had arrived the day before from Murree, and another, a Kashmiri coolie, who had also arrived the day before from the same place. The next case was that of a coachman who had likewise arrived from Murree on the 24th. He took ill at midnight, and died at 1 P.M. on the 25th. On this latter date there was another case, also a recently arrived fugitive from Murree; he recovered. On the 26th another fugitive from Murree was taken ill on the road, and carried to the city dispensary, where he died shortly after admission. On the 27th a resident of the city, who had not left the place, took ill of cholera; she recovered. On the same day a coolie employed at the fortified barracks was seized with cholera, and "died at once." On the 28th a police-constable of the jail guard, who had been on quarantine duty at Kohala, and returned on the 25th July, was seized; he recovered. On this day also a child was seized in the city. She was the daughter of the man who died in the dispensary on the 26th; she recovered. Also, on the same day, 3 residents of the city and a stranger from Murree were seized with cholera. The 3 residents recovered; the stranger died. On the 29th July 3 more residents, 1 of whom had just returned from a visit to Murree, were attacked; 2 recovered and 1 died. On the 30th July 2 more cases occurred in the city, both residents; 1 died the same day, the other next morning. After this the disease became general in the city and cantonments and villages around. One case of cholera, fatal, occurred among the European civil officers at Rawal Pindi, and some cases among the troops. The jail entirely escaped. In all, 356 cases with 198 deaths were reported from cholera among the Native community in the city and cantonments of Rawal Pindi.

In my tour through the Murree, Hazara, and Rawal Pindi districts, referred to on a preceding page, I investigated altogether, exclusive of those which had occurred in Murree station itself, 276 cases of cholera; and the result of my inquiry led me to the following conclusions, as recorded in a special report at that time submitted to the Punjab Government:—

"*First*, that the disease, or its cause, was not imported into Murree, but originated there independently. *Second*, that it became localised there as a centre of activity, and also subsequently in other places similarly conditioned as to density of population, such as Rawal Pindi, Haripur, &c. *Third*, that it was spread by means of atmospheric influences, aided by the direct action of cholera dejecta from the human body, as well as by errors in diet, clothing, and bodily exertion. In support of the *first* conclusion, no cholera case was known to have occurred anywhere within the districts named until after the appearance of the disease at Murree. The *second* conclusion is borne out by the fact that in a large number of cases the disease was conveyed to outlying villages by persons coming directly from the centre of its activity, and themselves being the first, and very often the only ones, to suffer an attack of it. The *third* conclusion is supported by the facts of the different results of its known direct importation into different localities, showing that where the atmospheric conditions were unsuitable, whether the population was dense or scattered, well situated as to sanitary conditions or the reverse, the disease failed to spread ; whereas where the atmospheric conditions were favourable to its development the disease rapidly spread."

But why the atmospheric influences of one locality, I added, should prove favourable to the development of cholera, and those of another, and perhaps contiguous, locality unfavourable, I was not prepared to explain, any more than I am to explain why the atmospheric moisture should collect into a cloud in one spot in the sky and not in the spot contiguous to it, or why a thunderstorm should sweep along one line and not in the line parallel to or athwart it.

Since I recorded these remarks, however, I have learned more about the causes of cholera, and am now prepared to offer an explanation which, whilst acceptable to the reason, is also in accordance with ascertained facts. But this must be left to appear in its proper place in a subsequent part of this history of cholera in India.

Whatever its causes, however, I claim it as an incontrovertible fact that, to again quote my report previously referred to—

"Cholera owes its spread or its check to the defective or the sound bodily health respectively of the members of the community amongst whom it appears ; " and I declare that "it is, in fact, the health condition of the subject himself, and not the mere circumstances of his surroundings alone, which determines the activity of the disease ; that is to say, the more perfect and sound the standard of individual health, the more complete the immunity from this terrible scourge. The mass of its victims is always from amongst the poor, ill-fed, scantily clothed, and hard-worked, with now and again the intemperate and careless."

Further I observed—

"Whatever the explanation of its *modus operandi*, however, the lesson for us to remember is the means to be adopted for its defeat. During the cholera season in this province, from May to November, every indication of its activity should be carefully watched for and anticipated by precautionary measures. (*a.*) The highest possible state of sanitation should be at all times maintained by the several municipalities within their respective limits ; but, besides this, on the first sign of the appearance of the disease the public should be warned to be on their guard, to be careful as to diet and clothing, to observe moderation in all things, to shun excesses of all kinds, and, above all other points, not to neglect any diarrhœa that may attack individual members. (*b.*) On the appearance of the disease in an epidemic form in any large city, the residents should be encouraged to camp out in the vicinity and to migrate to the neighbouring unaffected localities. Every large city should be provided with a site for the erection of temporary sheds or places of refuge in times of epidemic sickness. (*c.*) At such times the systematic distribution of food and clothing to the indigent is advisable, not as a mere charity, but as a measure of public protection, for it is amongst the destitute that the disease makes its first advances to the invasion of a city. (*d.*) Under no circumstances should overcrowding of the people be allowed, and all the recognised measures of sanitation, such as conservancy, disinfection, fumigation, house-to-house visitation, &c., should be carried out by the municipalities."

This was written in 1876, and subsequent experience confirms me in the belief of their importance and adequacy as preventive measures against attack from cholera.

The monthly rainfall and cholera mortality for the years 1875 and 1876 in the Rawal Pindi district were as follows :—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·30	2·60	1·10	0·20	1·40	0·90	9·40	14·30	12·00	1·90	0·60	4·10	48·80
	Cholera	...	...	...	...	...	1	...	...	...	...	...	...	1
1876.	Rainfall	4·30	2·35	3·30	2·75	1·62	1·15	12·51	4·39	1·60	1·03	1·83	0·30	37·63
	Cholera	...	...	...	...	...	2	109	343	160	11	1	...	626

Mark the increased cholera with diminished rainfall in August 1876, after the abundant fall in the preceding month. For the purpose of comparison I add here—under corresponding statistics for the two previous occasions on which the Rawal Pindi district was visited by epidemic cholera, namely, in the years 1872 and 1867. As in the above statement, the rainfall is that of the station of Rawal Pindi, the cholera mortality that of the whole district.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1871.	Rainfall	0·00	5·60	0·30	0·00	0·30	4·90	7·10	3·70	5·10	0·00	0·00	1·50	28·50
	Cholera	...	...	1	...	...	...	...	...	...	...	...	1	2
1872.	Rainfall	5·40	1·00	3·00	2·50	2·10	0·80	8·40	2·50	4·20	0·00	0·00	0·40	30·30
	Cholera	...	...	...	...	...	3	2	30	107	6	...	...	148

Here we find the increased cholera in September 1872 with defective rainfall, though greater than the still more defective fall in the preceding month, and free play given to evaporation such as the limited rainfall and declining temperature may produce.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.	Totals.
1866.	Rainfall	1·80	0·50	3·60	3·50	0·40	1·00	4·20	7·30	1·80	0·00	0·00	0·00	24·10
	Cholera	...	...	1	...	2	24	1	4	9	...	...	...	41
1867.	Rainfall	1·40	2·30	0·20	4·50	1·20	0·10	2·20	7·60	1·70	0·00	0·00	0·10	21·30
	Cholera	1	1	3	...	57	360	1,142	956	200	2	...	...	2,722

The figures for 1867 show cholera active during the drying up of the soil in May and June, and greatly more so with the light showers in July, but declining with the heavier fall in August.

Hazara.—Total deaths, 245, all between July and November. Altogether 73 places recorded cholera, of which 16 together registered 158, and the other 57 together 87 deaths. The largest number of deaths was returned by the town of Haripur, population 4477, viz., 25 from August to November; the next largest number, 16, by Balakot, population 11,400, all in October, except 1 each in September and November; then Bakot, population 1046, with 15, all in August, except the first, on 30th July. This was the first cholera death registered in this district; the next, on 1st August, was at Khanpur, population 2782, where altogether 7 deaths were registered, all in that month; the third was Haripur, on 3d August. Haripur and Bakot are at opposite extremes of the district. The monthly rainfall and cholera mortality in this district for the years 1875 and 1876 are shown as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·40	7·50	2·10	0·60	4·20	2·10	7·90	12·20	7·10	3·80	3·30	4·70	55·90
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1876.	Rainfall	2·40	1·80	4·70	2·10	2·90	0·90	12·70	15·80	2·10	4·00	2·40	0·50	52·30
	Cholera	...	...	...	...	...	...	4	50	93	92	6	...	245

Here in 1876 cholera commences in July with heavy rainfall after drought in June, progresses slowly under the rainfall of August, but prevails with nearly double the intensity with the light falls in September and October.

Gujranwala.—Altogether 34 places in this district recorded cholera, of which 14 together registered 238 deaths, and the other 20 together 34. The largest number of deaths was in the town of Wazirabad, population 15,346, where 72 were registered, all in August and September; the next, 35, in Dilawar, population 2023, all in September. The town of Gujranwala, population 20,362, registered 11, all in September. Some small villages suffered severely; thus Talwara had 21 deaths, Ladiwala 18, and Bohra 11. The disease first appeared in the town of Wazirabad on the night of the 14th–15th August, when a punkah-coolie was taken ill while pulling the punkah; he had returned a day or two before from a visit to Jhelum. The next case was that of a trolly-man on the railway works, who lived in the same house as the punkah-coolie, "attended him all through his sickness, arranged his burial, and then took ill himself and died on the 16th." On the 18th there were four cases, all in the town; one was a boy, aged 10 or 11 years, who used "to go out daily to graze his father's cows on the bank of the Palku stream;" another was a Hindu, aged 30, who had been with a marriage procession to Dingah, "and took ill on the very day of his return." Both these cases recovered, as also another, only one of the four dying. On the 19th two fresh cases occurred, both fatal, and then the disease began to spread, and was soon reported simultaneously in several places widely apart in the district.

"The epidemic was ushered in by the prevalence of diarrhœa, which was general, and was followed by sequela fever, from which few escaped. The latter was very fre-

quently associated with symptoms which were strongly choleraic, viz., vomiting, severe spasms, sudden and extreme prostration, shrunken features, and insatiable thirst. Such cases, usually on the third and fourth day, exhibited a rapid tendency to cerebral congestion and coma, and in whom recovery, when it took place, was very slow, and was accompanied by a peculiar dulness of the intellect, with partial loss of motor-power of the tongue and impairment of speech."

The monthly rainfall and cholera mortality for the years 1875 and 1876 are as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·00	1·70	0·00	0·00	1·50	1·00	21·20	15·20	3·10	1·90	0·00	0·60	46·20
	Cholera	...	...	...	1	...	...	...	...	...	8	...	...	9
1876.	Rainfall	0·20	0·50	2·20	3·10	1·30	0·30	20·60	2·40	0·40	1·80	0·10	0·00	32·90
	Cholera	...	...	...	...	1	1	2	66	168	33	...	1	272

Mark here in 1876 the activity of cholera with the light showers and drying up after the heavy rainfall of July.

Sialkot.—Altogether 36 places recorded cholera, of which 19 together registered 432 deaths, and the other 17 together 31. The town of Sialkot, population 32,989, registered 177 deaths, all in September, except 3 in the latter part of August. The first cases of cholera observed in this district occurred on the 14th August in the villages of Sidanwala, about 6 miles from Sialkot, and in Auliapur, distant 3 or 4 miles from Sidanwala; they were simultaneous and solitary. In the first village the case was that of a man who had returned the preceding evening from Lahore. At 9 P.M. he ate his usual meal, and at 11 P.M. went to bed apparently quite well. At 6 A.M. on the 14th August he was attacked with vomiting and purging, followed by collapse, and died about twenty-one hours after the commencement of his illness. In the second village the case was that of a man who had no communication with the first case; he recovered. On the 14th August cholera appeared in Muloki with a sudden outburst, in which 11 persons were attacked, of whom 3 died that same day. The disease continued up to the 25th, and in these eleven days there were 50 seizures and 19 deaths reported. "The village is surrounded with much stagnant water and by filth of all sorts." On the 19th August the village of Chand, also in the Pasrúr circle, was attacked with a similar outburst of the disease; 11 persons were seized on that day, and up to the 25th there were 29 cases with 12 deaths reported. On the 23d August cholera appeared in the village of Manga, near Muloki; 1 fatal case occurred on that day, none on the next, and then 9 cases with 5 deaths on the 25th; and so on with other places.

On the 26th August cholera appeared in the Sialkot cantonment; on that day a Native servant was attacked; he was a table-attendant in the service of the Deputy Commissioner, and had not left the cantonment, nor, so far as could be ascertained, had he been in communication with anybody from Jammu or other affected locality; he recovered. On the same day three cases of cholera occurred simultaneously in widely different parts of the town of Sialkot, 2 miles distant from the cantonment; all three cases were Muhammadans.

"They had no intercommunication with each other, nor had any of the Jammu people come into their houses, or even into the wards where they resided, nor had any one of them, or even any of their relatives, visited Jummu or any of the fugitives. These statements are made after very careful inquiry at the time and subsequently." (Civil Surgeon's Report.)

This is in reference to the prevalence of cholera at Jammu, 35 miles distant from Sialkot, during July and August, and the flight thence of large numbers of the residents, with whom it was generally believed the disease had been imported into Sialkot. It appears that cholera prevailed at Jammu with much severity towards the close of July and during the early part of August, and that in the second week of August the people in large numbers left the place and took refuge in Sialkot, Gujranwala, Lahore, and other towns. After the first 3 cases above mentioned the disease appeared in different parts of the town, and some of those attacked had come into contact with the fugitives arrived from Jummu; from the 26th August to the 29th September 350 cases with 176 deaths were reported in Sialkot town. In the cantonment there were altogether 28 cases with 15 deaths amongst Natives. In the jail the appearance of the disease is thus described :—

"One positive case of cholera (fatal) occurred on the 7th September. . . . The prisoner was a sweeper, and was attacked when employed about one of the latrines; there were, however, three fatal cases of diarrhœa, viz., one on the 3d, 7th, and 15th September. . . . During the whole period of the prevalence of cholera in the city there was a very decided tendency to looseness of bowels, colic, and other forms of indigestion, noticed among the prisoners, and a very general deterioration of health altogether."

The meteorological conditions of this year, it is recorded, "were so far exceptional that the rains had been very heavy indeed in July, no less than 27.8 inches having fallen between the 10th and 31st, the general average rainfall here for eight years being 11.7. The whole country was under water. In August the rainfall was 6.30 inches, which is less than the average of eight years, viz., 9.1. After the 15th August the rains began to get lighter, and the latter part of the month was very hot, and with many bright sunny days. All through this outbreak it was noticed that hot sunshiny days always showed a large number of cases, comparatively cool cloudy days decidedly fewer; as the days towards the end of September gradually cooled, so did cholera as gradually cease. In 1872 cholera appeared in Sialkot city on exactly the same date as it appeared there in 1876, viz., 26th August, and it ceased in both years about the same time, viz., after 20th September." (Civil Surgeon's Report.)

The monthly rainfall and cholera mortality for the years 1875 and 1876 are as follows :—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·00	2·20	0·00	0·00	0·40	0·60	17·80	22·40	4·00	0·70	0·30	0·50	48·90
	Cholera	1	...	...	...	...	...	...	...	74	216	3	...	294
1876.	Rainfall	0·50	0·20	2·10	1·50	1·50	1·30	32·00	5·10	5·80	0·60	0·00	0·00	50·60
	Cholera	...	...	...	...	...	...	...	42	388	33	...	...	463

Mark here in 1875 the heavy rains of July and August flooding the country, and with this no cholera; the light rains of September and October and drying up of the soil, and with this epidemic cholera. Had the rainfalls in July and August been a third of what they actually were, it may be safely asserted, considering the drought of the preceding months, that cholera would, in that case, have commenced epidemic activity in July; but the rainfall in that month and the next was so heavy as to swamp the country and for the time to reduce evaporation from the soil to a minimum. The same remarks apply to 1876; in this year epidemic cholera commenced in August with a very light rainfall following the excessively heavy fall in July.

For the purpose of comparison the corresponding statistics are here produced for the two previous occasions on which this district was visited by epidemic cholera, viz., the years 1872 and 1867.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1871.	Rainfall	0·80	4·20	0·00	0·00	2·10	6·30	11·00	3·40	3·00	0·00	0·00	1·20	32·00
	Cholera	...	...	...	...	1	1	1	1	...	...	2	1	7
1872.	Rainfall	2·00	2·30	2·80	1·70	1·80	0·60	6·10	1·60	3·50	0·00	0·00	0·40	23·30
	Cholera	1	...	...	...	...	2	27	38	188	27	...	...	283

Here in 1872 we find epidemic cholera in July with light rainfall after drought in June, and increasing with still lighter rainfall in the succeeding months, the fall in September only furnishing fresh material for more active evaporation.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1866.	Rainfall	1·20	0·90	0·00	0·90	0·40	2·20	14·70	11·60	0·90	0·00	0·00	0·00	32·80
	Cholera	...	16	...	8	13	7	6	2	4	5	2	1	64
1867.	Rainfall	0·70	0·30	1·60	4·50	1·70	1·00	9·70	26·20	1·30	0·00	0·00	0·00	47·00
	Cholera	5	6	9	10	27	52	146	132	258	19	...	...	664

These figures speak for themselves, and need no detailed explanation after all that has been previously said on the subject.

Peshawur.—Altogether 96 places in this district recorded cholera, of which 29 together registered 519 deaths, and the other 67 together 119. Peshawur city, population 58,430, registered 187, viz., 59 in September, 123 in October, and 5 in November. The village of Batgram, population 1227, registered 37, all in October; in Matta Mughal, population 4332, there were 31, viz., 20 in October and 11 in November; Kangra, population 1525,

had 22 deaths, all in October; Tangi, population 7269, had 26, viz., 1 in September, 20 in October, and 5 in November. In most of the other places affected the majority of deaths occurred in October. The first case of cholera reported in this district occurred in the city of Peshawur on the 13th September, and the disease continued in the city and adjoining cantonment till 9th November, and in the district till the 23d. The jail had only 1 fatal case. In the city cholera appeared with 3 cases on the 13th September, 2 of which died; no case appeared on the 14th; there was 1 case on the 15th, and 2 each day on the 16th and 17th; on the 18th, 19th, and 20th there were 4 cases each day. After this the disease became generally epidemic, and attained its climax on the 9th October, when there were 24 seizures and 13 deaths; there were altogether 330 seizures and 187 deaths, the last on 9th November. Prior to the outbreak there had been several cases of a suspicious nature, one of choleraic diarrhœa on the 18th August, another on the 19th, a third on 3d September, and one more on the 4th; on the 7th there was a doubtful case of cholera, which ended fatally on the 9th; there were besides "during the days immediately preceding the outbreak several cases of diarrhœa, &c.," which were reported as cases of cholera. It is stated that "malarious fever prevailed largely for some time before, during and after the epidemics of 1867 and 1869. In 1872, also, cholera appeared after a marked increase in the prevalence of fevers, which also raged during the cholera epidemic, and continued for some time after it. This year's fevers increased before and during the epidemic, but not to any large extent." Regarding the meteorology during the epidemic it is stated—"Sudden and great fluctuations of temperature in summer at Peshawur this year were remarkable as usual. The rain of the 1st and 2d October had an unfavourable, while that of the 26th idem a favourable, effect on the progress of the disease." The epidemic of cholera in Peshawur city in this year, 1876, was less violent than in any of the years before of which we have records.

The monthly rainfall and cholera mortality for the years 1875 and 1876 are as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·00	3·30	1·40	0·00	0·80	0·00	4·90	4·60	0·40	1·00	1·50	0·70	18·60
	Cholera	...	1	...	...	...	...	1	...	...	...	...	...	2
1876.	Rainfall	0·20	0·80	2·80	1·20	0·00	0·50	2·10	2·80	0·30	1·00	1·60	0·00	13·30
	Cholera	...	...	...	...	...	...	...	...	61	510	67	...	638

Here in 1876 we find epidemic cholera prevailing with light showers after a very defective hot-weather monsoon rainfall, at a time that the process of evaporation was going on under a rapidly declining temperature.

For the purpose of comparison the corresponding statistics are here produced for the previous years in which Peshawur has been visited by epidemic cholera, viz., 1872, 1869, and 1867.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1871.	Rainfall .	0·10	5·00	0·40	1·40	0·00	0·70	3·10	0·00	0·00	0·00	0·00	0·60	11·30
	Cholera .	...	...	...	2	...	...	1	1	...	...	...	...	4
1872.	Rainfall .	1·50	0·70	2·10	2·20	1·70	0·10	2·70	5·10	0·40	0·00	0·00	0·00	16·50
	Cholera .	...	...	1	...	1	1	...	2	1	310	76	...	392

Here in 1872 we find epidemic cholera at a season when the soil is drying up after previous months of heavy rainfall.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1868.	Rainfall .	0·30	0·20	2·30	3·60	0·40	0·00	0·50	0·00	1·00	0·00	0·00	3·40	11·70
	Cholera .	...	2	2	...	3	4	1	1	...	...	3	1	17
1869.	Rainfall .	1·70	0·90	2·30	0·20	0·00	0·70	0·00	0·90	7·00	1·60	0·00	0·00	15·30
	Cholera .	...	...	1	6	4	1	...	2	1,704	1,155	99	13	2,985

Here in 1869 we find epidemic cholera prevailing with free showers following upon four months of drought during the period of the hot-weather monsoon rains, the activity of the epidemic bearing some proportion to the activity of evaporation.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1866.	Rainfall .	0·80	1·30	3·80	0·50	0·70	0·00	0·00	1·30	1·20	0·00	0·00	0·00	9·60
	Cholera .	2	1	...	1	...	2	1	2	1	1	2	...	13
1867.	Rainfall .	0·00	0·50	0·40	2·70	0·80	0·00	0·00	3·10	0·00	0·00	0·00	0·40	7·90
	Cholera .	1	...	...	5	281	990	357	188	68	19	...	...	1,909

Here in 1867 we find epidemic cholera commencing with light showers in April after a period of more or less absolute drought for six months, and the epidemic attains its climax in the rainless June whilst the soil is drying up after the showers of the preceding two months; it then abates during a rainless July, and continues declining in August, the heavy rainfall of which month apparently sufficed to saturate the soil enough to prevent increased play of evaporation. During the drying up in a rainless September and October cholera was still active, though the epidemic was steadily subsiding.

Dera Ismail Khan.—Altogether 42 places reported cholera, of which 10 together registered 184, and the other 32 together 56 deaths. The town of Chaudhwan population 4934, returned 56 deaths in October and November; Draband, population 2446, had 33, all in the same two months; Tank, population 3186, had 19, all in September and October, except 1 in November; Khiri Khizar, population 2235, had 15, all in September; the town of Dera Ismail Khan, population 19,954, returned 18 deaths, 2 in September, 16 in October. The disease appears to have spread into this district from that of Shahpur, through the Jandanwala villages of the Bhakkur circle, where it appeared first on the 2d July at the village of Delhi, population under 500, in which 8 deaths, all in July, were registered. The disease did not at this time pass beyond the Indus at Bhakkar, and seems to have ceased suddenly, no signs of its activity being again observed until the 4th September, when it appeared at Khiri Khizar, a town in the extreme north-east of the district, built at the foot of a spur of the Suleman Range, which runs down to the Indus. On the 23d September the disease appeared in the border town of Tank, and on the same date in the city of Dera Ismail Khan. The disease prevailed with considerable severity along the frontier, but on the south side of the Indus, in the Bhakkar and Leiah circles, it did not prevail to any severe extent. Regarding the first appearance of the disease in July in Delhi village, it is recorded that the first case there was a traveller who had come from the Shahpur district "with the disease upon him." He died in the village on the day of his arrival, 2d July. On the 14th July 18 persons in the village of Delhi were seized with cholera, of whom 5 died; but between the 4th and 14th July 6 other cases had occurred in the village, and of these 2 died. Both these fatal cases had come from the Shahpur district, in which they were taken ill. It is also recorded that "the disease was almost entirely confined to the village of Delhi, and ceased after the fall of rain which took place on the Thall on the 15th, 16th, and 17th instant." Cholera does not appear to have manifested itself in epidemic form in the adjoining district of Dera Ghazi Khan. In June, however, the disease attacked the troops escorting Major Sandeman's party through the Bolan Pass, and was afterwards heard of at Kandahar, where it appears to have raged with great violence during September and October, in which months it was also epidemic generally in the whole country of Kabul west of the Suleman Range.

The monthly rainfall and cholera mortality in this district for the years 1875 and 1876 are shown as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall .	0·24	0·30	1·00	0·00	0·00	1·72	1·22	2·67	0·37	1·19	0·04	0·03	8·78
	Cholera .	...	...	...	...	1	...	...	...	1	...	...	...	2
1876.	Rainfall .	1·92	1·64	0·02	2·03	1·01	0·45	0·37	0·08	0·18	0·06	1·78	1·99	11·53
	Cholera .	...	1	...	...	...	...	9	...	32	117	81	...	240

Here in 1876 we find epidemic cholera prevailing with light showers

after three months of very deficient hot-weather monsoon rains constituting actual drought.

Kohat.—This district appears to have been but mildly affected. Some cases were returned from villages in the district, but no details are recorded. Altogether 24 deaths were registered, most of them in November.

From the preceding account it appears that the cholera of 1876 in the Punjab was an independent development of the disease in the north-western districts of the province, while the south-eastern districts remained remarkably exempt. The mortuary returns show that the disease first began to manifest its activity in the month of June in the Jhelum district, adjoining Kashmir territory; that it then, in point of time, successively affected the districts of Shahpur and Lahore; then Gujrat, between Jhelum and Lahore; next Bannu, adjoining Shahpur on the west; then Rawal Pindi and Hazara, to the north of Jhelum; then Gujranwala, between Lahore on the east and Shahpur and Gujrat on the west; next Sialkot, to the north-east of Gujranwala; then Peshawur, to the west of Rawal Pindi; and, finally, Kohat and Dera Ismail Khan, to the south of Peshawur, and separated from each other by the intervening and previously affected district of Bannu. Sialkot, the district nearest to and in most constant communication with Kashmir, where cholera was prevalent at an early period of the year, was not affected, epidemically at least, until the month of September, though the Jhelum district, adjoining both it and Kashmir, showed cholera active as early as June.

The rainfall of the year 1876 was 28.51 inches, or $1\frac{1}{7}$ inches above the average, and nearly $7\frac{2}{3}$ inches more than that of the preceding year. Its seasonal and territorial distribution was also very different from that of 1875. The fall in the first two quarters was considerably greater than that of the same periods in the preceding year, whilst that of the third quarter, or hot-weather monsoon, though above the average, was very considerably—more than one-third—less than that of the same quarter in 1875, and that of the fourth quarter was also abundant and somewhat in excess both of the average and of the same quarter in the preceding year. The most noteworthy difference in the seasonal distribution of the rainfall of the two years is, that in 1875 the hot-weather monsoon rains of the third quarter were preceded by nine months of drought, which for the first three months of that period was absolute, and for the other six months relative; whereas in 1876 the hot-weather monsoon rains were preceded by nine months of more or less copious rainfall, whilst the monsoon rains themselves were in more than average quantity. The territorial distribution of the rainfall, as will be shown in a subsequent passage in the summary review, was also different in the two years, the rainfall of 1875 being mostly precipitated upon the eastern districts of the province, and that of 1876 upon its western districts.

The food-supply of 1876 continued unusually abundant and cheap; the average price of wheat was 28.93 sers the rupee, a rate which was only surpassed in cheapness by the price in 1863, and was next approached in the past by that of 1862, and again by that of the preceding year, 1875.

1877.—In this year, the last of the triennial cycle, the periodical cholera epidemic which commenced in 1875 terminated its course, and the disease subsided to a minimum of prevalence. The incidence of cholera in 1877 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section. Among the civil population the death-rate was merely nominal, 0.001 per mille. This marked subsidence of cholera in 1877 was coincident with a continued abundance of the food-supply and unusually cheap prices, and with a rainfall which, though not

much more in amount than that of the preceding year, was quite exceptional in its seasonal distribution, and so disposed as to cause a very remarkable uniformity in the falls of the several quarters.

The only cholera mortality recorded in 1877 throughout the province consisted of a single admission, which proved fatal, among the jail population, namely, at Rupar, strength 1962, in October, and a total of 29 deaths among the civil population; these were distributed pretty evenly through the several months of the year, except December, in which month there was no cholera death recorded. These 29 deaths were all isolated cases, and were returned from 28 different places in 15 out of the 32 districts in the province; only one place, Khem Karn, in the Lahore district, returned 2 deaths, all the others 1 each (see Tables Nos. I. and II.)

Regarding the meteorology of the year, it appears that the mean temperature of 1877 was considerably in excess of that of the preceding year, but the daily range was slightly less. The most remarkable feature of the meteorology, however, was the very marked change in the distribution of the seasonal rainfall. The winter or cold-weather rains were in extraordinary excess of the average, and the summer or hot-weather rains in extraordinary defect, though the total fall of the year was above the average (see Table No. V.) The falls in the first and last quarters were $3\frac{7}{10}$ and $6\frac{7}{10}$ inches in excess of their respective averages. The fall in the second quarter was also in excess of its average by $1\frac{3}{4}$ inches, but that in the third was $10\frac{1}{3}$ inches in defect of its average, whilst the total fall of the year was nearly $1\frac{1}{2}$ inches above the annual average. The usual hot-weather rains, in fact, were absent in this year, and the cold-weather rains at the beginning and end of the year, that is, in its first and last quarters, were instead exceptionally heavy. This abnormal seasonal distribution of the rainfall was attended by a very marked diminution of the total mortality of the year, especially from the diseases classed under the heads "Fevers," "Bowel-complaints," and "Cholera." The great point to be noted in this connection is, that the abnormally great falls of rain in the first and last quarters were during seasons of naturally diminished temperature, whilst the normally great falls of rain in the second and third quarters of ordinary years take place during seasons of naturally increased temperature; consequently the effects of heat upon moisture in the soil are more actively displayed in the latter than in the former cases.

1878.—In this year, the first of the new triennial cycle 1878–80, the periodical cholera epidemic made its appearance in due time, and the disease prevailed with a revived epidemic activity. This activity, however, was of a very mild intensity for the first year of a cyclic cholera epidemic, and, as will be seen in the sequel, the cholera epidemic of this cycle did not run its yearly course with the usual regularity of initial intensity, intermediate abatement, and final subsidence, but, diverging from the normal order, prevailed with greatest intensity in the second year, reverting, however, to the normal course by subsidence in the last year of the cycle. The cause of this irregularity will be discussed in its proper place on a subsequent page. The mild activity of the epidemic cholera of 1878 was coincident with a very marked diminution of the food-supply and consequent great rise in prices, and with an increased rainfall, the seasonal distribution of which, however, was such as to prevent the occurrence of any period of drought till quite the end of the year; and it was such, moreover, as to suppress at its very commencement the first start of the periodical cholera epidemic of the cycle. The incidence of cholera in 1878 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

During 1878 the total of cholera deaths registered among the civil population throughout the province was 215, and of this number all but 8 were returned from the two adjoining districts of Delhi and Gurgaon, whilst of the remaining 30 districts only 6 recorded any cholera mortality; Lahore and Sialkot returned 2 deaths each, and the other 4 districts (see Table No. I.) only single deaths. Of the other 207 deaths the Gurgaon district returned 163, from 10 different places, and that of Delhi 44, from 4 different places. During the months of March, April, and May no cholera death was registered in any part of the province (see Table No. II.)

Gurgaon.—In this district the first place reporting cholera was the village of Ramgarh, population 608, in Hasanpur circle; here 10 deaths occurred, the first on the 7th July, the last on 13th July. The first case was that of a Brahmin, a resident of the village, who died after five hours' illness. The next place reporting cholera was the town of Hasanpur, population 3843; here 3 deaths were registered in July, the first on the 23d of that month. After these deaths in July no other cholera mortality was recorded in Hasanpur until the month of November, when there was a sharp outbreak of the disease, and 27 deaths were registered, all in November. In the town of Hodal, population 7032, cholera appeared on the 29th July, on which date 4 persons were attacked, of whom 2 died. On the 30th there were 2 fresh cases, of which 1 died. A few more cases occurred here, but they all recovered. At Palwal, population 15,553, there were 12 cases and 6 deaths reported; the first case occurred on the 25th July. On the 7th August a single death occurred in the village of Saloni, population 766, in Palwal circle. On the 12th August cholera appeared in the town of Rewari, population 25,190, and here 49 deaths were registered, 40 in August and 9 in September. The disease burst out among the tanners of the town, of whom 6 were seized on the 12th and another on the 14th. On the next day the disease appeared simultaneously in different parts of the town, and there were 25 seizures with 4 deaths. During the next few days the daily seizures numbered from 20 to 25. On the 20th there were 15 seizures, 28 on the 21st; on the 22d there were 12, and 5 on the 23d; altogether there were 239 seizures and 49 deaths. For some time previous to the outbreak there was a good deal of diarrhœa amongst the distressed and poor classes of the people. This diarrhœa is described by the assistant surgeon as "a most severe and obstinate type of diarrhœa, invariably terminating in collapse and death." In the town of Farukhnagar, population 10,594, there were 30 deaths, 5 in August and 25 in September. The first case occurred on the 25th August, and there were altogether 87 seizures. In the village of Mubarakpur, population 1212, in Farukhnagar circle, there were 30 deaths, all in September, the first on the 7th. In Akbara, population 2489, in Nûh circle, there were 2 deaths, both on 31st August. Many of these cases occurred among the poor famine-stricken refugees from Alwar and Jeypore territories.

Delhi.—In this district, of the 44 deaths registered 12 occurred in the city of Delhi and 17 in the suburbs, 8 in Chandaoli and 7 in Sahupura, both villages in the Balabargh circle. In Delhi a case of cholera is said by the civil surgeon to have occurred on the 6th April, but the first registered death occurred on the 10th June, and until September solitary cases, quite unconnected with each other, cropped up in different and often widely separated parts of the town. In August the disease appeared in the Poorhouse, "where several hundred famine-stricken wretches were crowded together;" here 12 cases occurred up to the 20th September, when the disease ceased.

In the Lunatic Asylum there were two cases, one on 21st August, the other on 26th September. In the two villages affected in Balabgarh circle, the disease is believed to have spread up from Gurgaon district; in Chandaoli there were 19 seizures and 8 deaths, in Sahupura 14 seizures and 7 deaths.

From the above details it appears that the cholera epidemic of this cycle made its appearance with the advent of the hot-weather monsoon season, but prevailed only in the Delhi and Gurgaon districts, and even there in only very mild epidemic force, notwithstanding the pressure of famine-distress among the populations of those districts. This mild prevalence of epidemic cholera in these two districts, and the entire absence of the disease in epidemic form from all the other districts of the province, is explained by the character and distribution of the rainfall of the year, considered from the point of view which I have already illustrated and described in many preceding passages of this history. The monthly distribution of the rainfall of 1878 in the Delhi and Gurgaon districts differed from that of all the other districts of the province in the character of the successive monthly falls, and was such as to produce periods of more pronounced drought and of greater duration immediately preceding the advent of the hot-weather monsoon rains. In the subjoined statements are shown the monthly rainfall and cholera mortality in each of these two districts for the years 1877 and 1878, the former year being included for the purposes of comparison :—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Gurgaon. 1877.	Rainfall	1·80	1·50	0·70	0·90	0·90	4·80	1·40	0·10	1·80	2·40	0·00	3·50	19·80
	Cholera	...	...	...	...	1	...	1	...	...	...	...	...	2
Gurgaon. 1878.	Rainfall	0·90	1·50	0·00	0·00	0·40	0·90	8·50	15·00	0·90	0·00	0·00	0·00	28·10
	Cholera	...	...	...	...	...	...	16	54	66	...	27	...	163

Here in 1878 we see the epidemic cholera breaking out with the copious rainfall in July after a four months' period of drought.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Delhi. 1877.	Rainfall	2·30	2·10	0·20	0·20	0·30	3·70	1·30	0·10	0·00	5·30	0·00	2·40	17·90
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
Delhi. 1878.	Rainfall	1·10	1·20	0·10	1·50	0·80	0·40	13·60	18·80	0·60	0·00	0·00	0·00	38·10
	Cholera	...	...	...	...	...	2	16	15	4	7	...	...	44

Here again in 1878 we find cholera breaking out epidemically in July with the heavy rainfall of that month after a period of drought. In both cases—Gurgaon and Delhi—the activity of the commencing epidemic was suppressed by the excessive rainfalls of July and August saturating both soil

and air with moisture to such an extent as to impede free evaporation; besides which the declining temperature of the season was another factor in checking the activity of evaporation after the heavy rainfall had ceased.

In none of the other districts is such a distribution of the monthly rainfall—namely, light showers or drought in the second followed by excessive rainfall in the third quarter—observable. In them the seasonal rainfall is more equally and uniformly distributed through the successive months. This will be seen from the following summary of the rainfall of the year. The rainfall of 1878 amounted to 31.24 inches, or nearly $3\frac{9}{10}$ inches in excess of the average, and $2\frac{1}{10}$ inches more than that of the preceding year (see Table No. V.) The fall in the first quarter was 4.00 inches, or nearly $\frac{1}{5}$ inch in excess of the average for that period, and it followed an extraordinarily excessive fall in the preceding quarter, the last of 1877, in which the excess was $6\frac{1}{10}$ inches above average. In the second quarter the fall was 6.29 inches, much the same amount as the fall in the corresponding period of the preceding year, and $1\frac{8}{10}$ inches above average; no such heavy falls in this quarter had occurred in any previous year of our series of twenty, excepting 1871, which also was a year of minimum cholera prevalence. The fall in the third quarter was 20.47 inches, or 3 inches in excess of average, and nearly $13\frac{1}{2}$ inches more than the fall in the same period of 1877; following upon a considerably more than average fall in the preceding quarter, it sufficied to saturate soil and air with moisture, and thus to check undue activity of evaporation; and with this condition of affairs there was no epidemic cholera anywhere in the province, except in the two districts where the distribution of the rainfall did not conform to the above general description. In the fourth quarter the fall was only 0.48 inch, or nearly 1 inch in defect of the average; the effects of this defect are connected with the epidemic cholera of the following year. So small a fall in the fourth quarter had not been recorded in any previous year back to 1862, except in the years 1866 and 1874, in each of which the fall in the fourth quarter was very much less. In both of these years, as was the case also with 1878 (see Table No. V.), this deficient rainfall in the last quarter of the year was followed by a continuous defect in the first quarter of the succeeding year; and then, in each case, the hot-weather monsoon rains were below the average quantity, except in 1875, when they were not only in great excess, but also very disproportionally distributed between the second and third quarters, the former receiving little more than half its average supply, and the latter nearly two-thirds more than its average quantity—a distribution which, so far as the effects of rainfall on the soil is concerned in respect to the production of evaporation, more or less equalised or assimilated the climatic conditions of the three years in question, viz., 1867, 1875, and 1879, each of which was distinguished by epidemic cholera activity.

The food-supply of 1878, after five years of abundance and cheap prices, showed signs of marked deficiency, and a sudden and great rise in prices took place; the average price of wheat was only 17.90 sers the rupee against 27.31 sers the rupee in the preceding year.

1879.—In this year, the second of the cycle, cholera prevailed with irregular and excessive epidemic severity; the normal cyclic order of initial severity followed by abatement was transposed between this and the preceding year. The cholera death-rate in 1879 among the troops and jails together was 7.48 per mille of strength against only 0.12 in 1878; among the civil population it was 1.49 per mille against only 0.01, respectively. This remarkable and, for this year of the triennial cycle, unusual severity of

epidemic cholera was coincident with a great deficiency in the food-supply and a sudden and great rise in prices, and with a marked deficiency also in the rainfall, the seasonal distribution of which, moreover, was irregular, and of a nature to produce considerable divergence from the ordinary climatic conditions. Add to these that the year 1879 was one of unusual movements among the people in connection with the war operations in Afghanistan on the one hand, and the great *Kumbh* fair at Hardwar on the other—movements and journeyings which entailed unusual exposure to hardships and weather influences.

The incidence of cholera in 1879 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

Among the civil population of the province the cholera mortality registered is shown by districts in Table No. I. and by months in Table No. II. The epidemic cholera of 1879 in the Punjab was on a scale of magnitude and general diffusion resembling that of the epidemic cholera of 1867, like which year also this was a *Kumbh* fair year at Hardwar.

The death-returns show that during the first three months of 1879 cholera in the Punjab was in complete abeyance. The local epidemic outbreaks during the latter half of the preceding year in the districts of Gurgaon and Delhi had completely subsided by the end of November of that year, and had left no trace of a lingering presence even during the succeeding four months up to the general and sudden outbreak of the great epidemic cholera of 1879. In all the districts of the Punjab there was a marked quiescence of cholera during the first three months of 1879; in January the province registered but 7 deaths, of which 3 were returned by Sialkot and 2 by Ludhiana, and 1 each by Gurdaspur and Gujrat; in February 4 deaths were registered from as many districts; and in March but 2 in the adjoining districts of Lahore and Gurdaspur, 1 in each.

In April the mortality rose at a bound to 2603 deaths registered, every district up to the Indus contributing its quota, with the exception of Gujrat and Shahpur and the usually exempt areas of the Mooltan division. The start of the epidemic cholera of 1879 in the month of April was clearly defined, decided, and comprehensive. In May the disease crossed the Indus in the north-west of the province, involved the as yet unaffected Gujrat and Shahpur districts, and extended southwards to Montgomery. In June it overtook Jhang, and in July Bannu. But with this wide range the actual prevalence of the disease, as indicated by the mortality returns, was by no means uniformly equal in its incidence everywhere. On the contrary, the figures disclose a very marked difference in the force of the epidemic in different parts of the province, and they show also different periods at which the disease attained its climax in the different districts. For the province as a whole the monthly course of the disease in its rise and fall is illustrated by the figures in Table No. II., but for the districts separately there are some deviations from the seasonal course of the disease through the province as a whole.

Thus in the south-eastern districts of the Delhi and Hissar divisions, and up to the Umballa district inclusive, the epidemic burst out simultaneously with a force and uniformity of prevalence very different from that observed in the four adjoining districts to the north-west, viz., Simla, Ludhiana, Jullundur, and Hoshiarpur, as well as in the districts of Gurdaspur and Sialkot, extending north-westward from the last. In the area covered by the first group of districts the epidemic rapidly attained its climax in May, sensibly

declined in June, in July subsided, and in August ceased altogether, excepting only an unimportant lingering of the disease in the Umballa district until the following month. In the area covered by the second group of districts, which, like the preceding, is a continuous area, the disease manifested a weak, intermittent, and nowhere steady or rapid rise to a climax. In Ludhiana alone was there any sign of a steady progress to a climax, attained in June; whilst in all the other districts of this group the progress of the disease is shown by the death-returns to have been indecisive, fitful, slow, and intermittent, and most markedly so in Gurdaspur and Sialkot. Beyond these two areas, in a direction towards the west and north-west, are two other areas comprising each its group of districts in which the cholera of 1879 manifested distinctive features in respect to its period of epidemic activity and its period of maximum intensity. But before proceeding to trace the deportment of the disease in these two areas, it will be convenient first to dispose of the outlying district of Kangra, where cholera pursued a different course to that followed by it in the other areas of the province epidemically affected.

The district of Kangra, at the foot of the Himalaya, and including its terminal spurs towards the plains, is situated directly to the north of the district of Hoshiarpur, from which it is separated by the River Beás. Hoshiarpur, as already stated, was one of the districts of the second group constituting the area in which the cholera of 1879 in this province manifested a weak, indecisive, and intermittent epidemic prevalence. In Kangra, in common with the rest of the affected districts up to the Indus, cholera commenced in April with considerable initial force, but, unlike the other districts, it did not maintain this activity in the succeeding months. On the contrary, whilst cholera in the other epidemically affected districts was steadily increasing during the months immediately following its outburst in April, here in Kangra it was steadily decreasing; the mortality of the disease here in May was about only one-half that in April, and in June about one-third. But in July, when the disease had thoroughly subsided from its epidemic activity in all the south-eastern districts up to Umballa inclusive, it here, in Kangra, commenced an independent epidemic career, with an initial outburst not far short of double the force of the first outbreak in April, and in August suddenly attained its climax, represented by 1370 deaths in that month against 156 in the preceding; the decline was proportionately rapid, and is represented by 373 deaths in September and 12 in October; and the disease finally ceased here with only 2 deaths in December. In no other district of the province was the maximum mortality attained in August.

It will be seen in the sequel how exactly in conformity with the character and distribution of the rainfall in these areas and districts were the several distinctive features of the cholera prevalence above described; and not only in these, but also in the other areas and districts now to be referred to—I mean the two areas of epidemic cholera westward of the second group of districts before mentioned. The first of these includes all the districts in a north-west direction, from Ludhiana and Jullundur on the east to the Indus on the west; and the other includes the north-western frontier districts beyond the Indus.

In the first group the most easterly districts are those of Ferozepore, Amritsar, and Lahore; then Gujrat, Gujranwala, and Shahpur; and then Jhelum, Rawal Pindi, and Hazara. This area is crossed from north-east to south-west by the Sutlej in the east, then the Ravi, Jhelum, and Chenab, and is bounded by the Indus on the west. The south-eastern of these districts

are well out in the open plain; the north-western hug the Himalaya Mountains, in Hazara penetrate among them, and in Rawal Pindi include some of their outer ridges; the south-eastern districts of this group comprise Ferozepore, Amritsar, Lahore, Gujranwala, and Shahpur; the north-western comprise Gujrat, Jhelum, Rawal Pindi, and Hazara. In all the area covered by these districts, taken as a whole, the cholera of 1879 attained its maximum intensity in the month of June, with the one exception of Amritsar, in which it was attained in May, that district being one of the most easterly of the group.

But the commencement of the epidemic was not by a simultaneous outburst in all parts of the area. In Amritsar and Hazara, at opposite extremes of the area, the outburst in April is very marked, as it is also in Jhelum, about midway between them; in Lahore and Rawal Pindi the commencement of the epidemic in the same month is clearly marked; in Gujranwala and Ferozepore it is less so, though here and in Hazara also the presence of the disease is declared in April. In the district of Gujrat, which lies between Gujranwala and Jhelum, and of Shahpur, which lies to the south of Gujrat and Jhelum, cholera did not manifest itself till May; but whatever the month of its commencement, the disease everywhere in this area attained its maximum intensity in the month of June, with the one exception of Amritsar before noted. The decline was steady and gradual, and by the end of October the disease had ceased everywhere in this area, and in some of the districts, as Ferozepore, Gujranwala, Gujrat, and Shahpur, as early as the end of September.

In the second of these two groups, comprising the northern trans-Indus districts of Peshawur, Kohat, and Bannu, which, like the districts of the preceding group, also cover a continuous area (notwithstanding the strip of independent territory which contains the hill pass between Peshawur and Kohat), the deportment of the epidemic shows less uniformity than is observed in its course over the other affected portions of the province; this result may perhaps be due in a measure to the defective registration which is known to be common to all these frontier districts, with the exception, to some extent at least, of Peshawur. However, taking the figures as they stand, the epidemic is shown to have commenced in Peshawur and Kohat in May, and in Bannu not till July. In Peshawur the outburst is represented by the maximum intensity in the one and same month of May; in the two following months the intensity of prevalence is still high; the disease then gradually subsided through the next three months, and finally ceased in November. In Kohat, commencing in May, the epidemic attained its maximum intensity in June, and thereafter subsiding, ceased entirely in the beginning of October. In Bannu the disease was present in June, but did not become epidemic till the next month, in which it seems to have attained its climax, to have then subsided to a minimum in September, and to have again flickered up before its final cessation in the end of October.

In the remaining area of the province covered by the south-western districts of the Mooltan and Dera Ismail Khan divisions the epidemic cholera of 1879 made no great progress, and the greatest portion of the area was entirely untouched by the disease. In the Jhang and Montgomery districts alone of this area did the disease assume any marked epidemic prevalence. Both these districts are situated in the north-eastern part of this area, adjoining the districts of Lahore, Gujranwala, and Shahpur, in common with which they appear to have come within the influence of the epidemic. In the northern portion of the Dera Ismail Khan district, also bordering upon the epidemic area of the disease, there was a slight manifestation of the activity

of cholera during the epidemic season, and an isolated little outbreak occurred in December.

With this brief notice of the diffusion of the cholera of 1879 in the Punjab, I proceed to note the principal records in connection with the appearance and course of the disease in the several affected districts. It has already been stated that only 13 deaths were registered from cholera in the whole province during the first three months of 1879, and that in April the epidemic burst out with sudden and widespread violence, represented by a total of 2603 deaths registered in that month. I commence, therefore, with the month of April, having already mentioned the mortality in the preceding months of this year.

The earliest cholera deaths in April were recorded in 5 different places, and all within the first week, viz., 1 in Lahore, 1 in Sialkot, 1 in Hissar, 1 in Gurgaon, and 1 in Kangra. In Gurgaon the first case was seen and treated by the civil surgeon on the 2d April. The patient was a pilgrim on his way from Jeypore to Hardwar, and he died in the Gurgaon station. On the 5th April cholera appeared in the village of Firozpur Mer, population 150, in the Gurgaon district. Here the first case was that of a cart-driver, a resident of the village, who had gone to Muttra, in the North-Western Provinces, where cholera was prevalent. On his way back he was taken ill on the road, and on arrival at home, on the 5th April, he died of cholera. On the same day another case of cholera occurred in this village, and on the 7th a third; altogether 42 cases and 20 deaths occurred among the small community of this village before the middle of the month.

In Kangra, which is in the extreme north of the Eastern Punjab, as Gurgaon is in its extreme south, the first case of cholera was reported on the 2d April—the same date as that in Gurgaon—in the town of Kangra. The sufferer was a Hindu shopkeeper, resident of a village in the Jagadhri circle of Umballa district, and was on a tour of pilgrimage to various Hindu sacred places. He had visited Hardwar and Joalamukhi, and arrived at Kangra on the 2d. He was taken ill with cholera the same night, and died the next day. Following this cholera appeared at Joalamukhi, where a woman, a resident of the place, was attacked, and died on the 5th April. Her death was followed by that of her son. Three of her relatives went off to the village of Dera, 7 miles distant, and by the day after arrival there a woman of the same family at Dera took ill and died. Previous to these cases a suspicious death, supposed to have been from cholera, occurred at Joalamukhi on the 31st March; and between the 3d and 5th April another case of undoubted cholera occurred in Joalamukhi, whence the patient was removed to Dera, where he died. Between the 7th and 12th April 15 cholera deaths were registered in this district, and 10 of them occurred in the town of Joalamukhi. The town of Joalamukhi is a celebrated and favourite place of Hindu pilgrimage; an annual fair is held there for ten days in the month of March; it is attended by about 20,000 people. In 1879 the fair lasted from about the 23d March to the 1st April. The cholera outbreak here, it is to be noted, occurred before the dispersion of pilgrims from the Hardwar fair.

The Hardwar fair in this year lasted from the 15th March to the 16th April, the most auspicious day for the bathing being the 12th April. But in all the period of the fair many pilgrims arrived, and bathed, and departed daily. By the 25th March there were about 100,000 people present at the fair, and up to the 26th March 4 cases of cholera were reported to have occurred at the fair. The general dispersion of pilgrims from the fair took place on the 13th and 14th April, and in their journeyings homewards they

everywhere suffered severely from exposure to the cholera influence, which about that time was overspreading the province, and thus very greatly added to the sum total of the mortality caused by the epidemic, as will be seen by comparing the mortality of 1879 with that of the next preceding epidemic years 1875 and 1876 and 1872 in the several districts of the province. It will be seen that the mortality of 1879 was much greater in most of the districts than in either of the above epidemic years, but that in some it was very little more, and in others very much less. The different incidence of the disease in the several epidemic years is clearly shown district by district in Table No. I. The record is very interesting and instructive considered in connection with the rainfall, and, apart from this, proves at least that the diffusion and prevalence of cholera are in no way dependent upon the agency of human intercommunication. For instance, in 1872 Umballa registered 1121 deaths, in 1879 only 609; similarly Ludhiana 717 against 255. The difference is still more striking in many others of the districts, as will be seen by reference to Table No. I.

I now proceed to show the relation of cholera prevalence to the rainfall in 1879 in the several districts of the province epidemically affected, and for the purpose of comparison in each case produce the corresponding statistics for the preceding year.

Delhi.—The monthly rainfall and cholera mortality in the Delhi district for the years 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	1·10	1·20	0·10	1·50	0·80	0·40	13·60	18·80	0·60	0·00	0·00	0·00	38·10
	Cholera	...	...	...	...	...	2	16	15	4	7	...	...	44
1879.	Rainfall	0·00	0·21	1·03	0·05	0·00	6·79	15·28	8·99	2·29	0·09	0·00	1·22	35·95
	Cholera	...	...	...	78	140	187	3	6	2	...	...	...	416

This record is very interesting. We find three rainless months at the end of 1878 followed by a fourth rainless month in the beginning of 1879, and this by trivial showers in the succeeding month, all in the cold season. In March occurred the first good rainfall, but the season was still that of the cold weather, the mean temperature of March being only 6·8° greater than that of February (see paragraph on meteorology in historical notice of 1870), and there was not any very active evaporation. But in April, the mean temperature being 11.5° greater than in March, the rainfall of that month, aided by the slight showers in April itself, afforded material for a more abundant activity of evaporation. With these conditions we find cholera breaking out in epidemic form in April. In May there was no rainfall, but a mean temperature 12.2° higher than that of April continued to dry up the previously moistened soil, and with this continuance of evaporation epidemic cholera increased. In June the hot-weather monsoon rains set in with a fairly copious supply, but with a mean temperature 4.5° higher than that of the preceding month, and falling upon a parched soil it at first only added fresh material for more free evaporation, and cholera continued to advance. In July, however, an unusually heavy fall, coupled with a decline of 2° in the

mean temperature, sufficed, in addition to that of June, to thoroughly saturate soil and air with moisture, and thus to put a stop to evaporation; and with this change of conditions we find that the epidemic of cholera suddenly ceased, and did not revive for want of recurrence of the previous climatic conditions.

In this district altogether 53 places recorded cholera, and in 32 of them the deaths reported were less than 5 each, 14 of them having only single deaths. The total number of seizures was 902, and deaths 416. From the Delhi district 21,550 persons are said to have attended the Hardwar fair, of whom none died in the road going to it; but 6 of them died at the fair, and 19 on the road on their return journey.

Gurgaon.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·90	1·50	0·00	0·00	0·40	0·90	8·50	15·00	0·90	0·00	0·00	0·00	28·10
	Cholera	...	...	...	...	...	...	16	54	66	...	27	...	163
1879.	Rainfall	0·00	0·20	0·50	0·00	0·00	1·30	6·20	8·50	2·90	0·50	0·00	0·35	21·45
	Cholera	...	...	...	84	384	249	17	19	...	...	...	...	753

Here in 1879 epidemic cholera began in April, and continued increasing in May during the drought following the light rainfalls in March and February. In June with the light rainfall of the commencing monsoon the disease continued active, though sensibly on the decline, and rapidly subsided with the heavier falls in the next two months.

In this district altogether 102 places recorded cholera, and in 71 of them the deaths did not exceed 5 each. A total of 1514 seizures and 753 deaths was reported. Approximately 5028 persons from this district attended the Hardwar fair, of whom 1 died on the road going and 40 on the return journey.

Karnal.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	1·30	1·60	0·90	4·60	2·00	0·40	2·80	10·30	1·80	0·00	0·00	0·90	26·60
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·90	0·60	0·00	0·00	3·20	8·50	8·40	1·30	0·00	0·00	0·30	23·20
	Cholera	...	...	...	181	1,071	330	13	7	4	...	...	...	1,606

Here again in 1879 epidemic cholera breaks out and increases during April and May with the drying up after rains in March and February, and declines

and rapidly subsides with the first rainfall in June and the subsequent copious falls in the succeeding months.

Altogether 193 places in this district recorded cholera, and in 111 of them the deaths did not exceed 5 each. A total of 3028 seizures and 1606 deaths were reported. About 5080 persons from this district attended the Hardwar fair, of whom 15 died on the journey back.

Hissar.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	0·70	0·58	0·00	1·20	1·70	1·40	4·30	10·60	0·00	0·00	0·00	0·00	20·48
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·10	0·30	0·00	0·20	0·90	0·40	7·30	1·40	0·00	0·00	2·00	12·60
	Cholera .	...	...	...	988	2,269	390	25	2	...	...	...	...	3,674

In this arid sandy tract we find the epidemic cholera of this year bursting out with much violence in April with the drying up of the light showers of the two preceding months, greatly increasing with the light showers in May, subsiding with somewhat heavier showers in June, lingering with light falls in July, and ceasing with the heavy falls in August.

Altogether 334 places in this district recorded cholera, and in 195 of them the deaths were less than 5 each. The epidemic was widely diffused over this district, and gave a death-rate of 7.85 per mille of population. Of the large towns, Bhiwani, population 33,220, registered 148 deaths; Hansi, population 12,210, returned 132; Hissar, population 14,162, gave 86; Fatahabad, population 3084, had 81. Some villages also suffered severely; Barwa returned 69 deaths, Davita 79, Lisai 61, Mahota 47, and so on in many others. About 16,750 persons from this district went to the Hardwar fair, and about 33,000 pilgrims belonging to the States of Rajputana passed through the district.

The majority of the pilgrims carried with them a month's supply of provisions, chiefly small cakes made of flour cooked in oil, and sweetmeats also cooked in oil; these may have been wholesome enough when they started, but must have become indigestible before the pilgrims finished their long journey.

The pilgrims returned *vid* Karnal and Sufedún, and along the canal road to Hansi. "During the two previous years this district had suffered severely from the drought of these seasons. About the height of the epidemic, on the 18th May, there was a very severe storm in this district, but the disease does not seem to have been more than temporarily affected by it." Writing on the 28th May the Commissioner says—"The weather is very hot, and there is no wind, and what there is is either southerly or south-east; and wind in the east is always bad for man and beast." The adjoining Jhind territory suffered as severely as Hissar.

Rohtak.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	0·60	0·60	0·20	1·40	0·80	1·70	5·20	9·30	0·70	0·00	0·00	0·00	20·50
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·50	1·20	0·00	0·00	3·30	2·60	10·80	2·50	0·00	0·00	0·00	22·80
	Cholera .	...	...	...	331	1,462	215	12	...	...	...	...	...	2,020

Mark here that epidemic cholera in 1879 breaks out and increases in April and May during the drought following the rainfall in March and February, declines with the rainfall of June and July, and ceases with the heavy fall in August.

Altogether 180 places in this district recorded cholera, of which 103 returned less than 5 deaths each. A total of 4188 seizures and 2020 deaths were reported. The town of Beri, population 9200, registered 167 deaths; Mahm, population 6768, had 71; Sanghi, population 5117, had 51; Rohtak, population 14,994, returned 54; Majra, population 7906, had 52; Batana, population 6197, gave 39; and Kalanor, population 5846, had 26. About 3700 persons from this district attended the Hardwar fair, of whom 234 died of cholera on their return thence.

Sirsa.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	0·10	0·50	0·00	3·40	3·50	1·60	3·60	9·80	0·10	0·00	0·00	0·90	23·50
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·10	0·52	0·00	0·00	1·12	1·34	5·39	1·38	0·00	0·00	0·72	10·57
	Cholera .	...	...	...	170	668	216	34	...	...	...	...	...	1,088

Here the same sequence of events is observed as in the preceding districts. The cholera of 1879 breaks out into epidemic activity in April and increases in May during drought after light rainfalls in March and February; it abates with the rain in June, subsides with that of July, and is absent with the heavy fall in August.

Altogether 140 places here recorded cholera, and in 17 of them the deaths were less than 5 each. A total of 2069 seizures and 1088 deaths were reported. About 2930 persons from this district attended the Hardwar fair, of whom 81 died of cholera on the return journey. The village of Alika, population 613, registered 131 deaths; Dúng, population 205, had 65; Jodhka, population 862, returned 85; Rania, population 4917, registered 184; and Surúja, population 874, had 53. Thus these 5 places together registered 518 deaths, or little less than half the entire registered cholera mortality of the district. The town of Sirsa, population 12,807, returned

35 deaths; Ellenabad, population 3299, had 19; the village of Sangala 33, of Mungala 18, and several other villages suffered very severely. Regarding the outbreak in the little Muhammadan village of Alika above mentioned, it is stated that "none of the inhabitants went to Hardwar, but on the 29th April it was reported that out of 15 persons attacked 5 had died;" there were altogether 244 seizures and 131 deaths reported from this village. In connection with this outbreak it is related that some cartmen arrived at the village about the 30th April (after there had occurred 15 seizures and 5 deaths) from Hissar, and that one of them died there, and his corpse was washed in the village tank, which was the only source of water-supply of the inhabitants, it being the only tank there, and there being no well in the village. According to the seizures reported, considerably more than two-thirds of the inhabitants were affected by cholera. Regarding the outbreak at Jodkha, it is stated that no pilgrims went to Hardwar from that village, "but that it is situated on a road used by some of the people who came back thence." These pilgrims began passing through Jodhka on the 17th April; the first case of cholera, it appears, occurred there on the 20th April, and of 117 persons attacked 85 died within a fortnight. Here also, it is said, pilgrims bathed in the village tank on the 22d April. The Magistrate made inquiry into these alleged circumstances, but without being able to verify the story of the corpse being washed in the village tank. He reported, however—"And it is a fact that as soon as cholera appeared the villagers ceased to drink the tank water, and began to bring the water from a village at a little distance, between 1 and 2 miles."

Umballa.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	2·00	4·40	0·40	2·50	2·70	0·20	8·70	13·90	2·60	0·10	0·00	1·50	39·00
	Cholera .	...	...	...	...	...	...	...	1	...	...	...	...	1
1879.	Rainfall .	0·20	1·00	1·30	0·00	0·00	8·10	4·00	8·10	0·50	0·00	0·00	0·70	23·90
	Cholera .	...	1	...	164	252	143	12	14	20	3	...	...	609

In this district the spring rains of February and March 1879 were not preceded by some months of more or less absolute drought, as was the case in most of the preceding districts, and the drought of April and May did not produce so sudden and quick an evaporation here as it must have done in the slightly damped more thirsty soil of the preceding districts. It is probably to this circumstance that is referable the milder force of the epidemic cholera which here, as in those districts also, broke out and increased during the rainless and growingly hot months of April and May. As in those districts so here also the heavy rainfall in June checked the disease; but it lingered till October, and showed a slight tendency to increase under the light fall in September after the heavy fall in August.

In this district altogether 159 places recorded cholera; 132 of these returned less than 5 deaths each, and in 44 of them there were only single deaths. A total of 1839 cholera seizures and 609 deaths were reported.

About 15,250 people from this district went to the Hardwar fair; of these 180 are said to have died of cholera on their return thence.

Ludhiana.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	1·10	1·18	0·33	4·52	2·93	0·35	9·93	15·20	1·76	0·00	0·00	0·33	37·63
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·60	0·00	2·44	0·18	0·55	8·74	2·65	4·53	1·11	0·00	0·00	0·85	21·65
	Cholera .	2	...	...	23	53	120	43	13	...	1	...	...	255

Here the epidemic cholera of 1879 commenced in April and increased in May during light showers following the heavier rainfall in March. In June the disease probably attained its climax before the heavy rainfall of that month set in, and then began to abate; but it still continued active under the light rainfall in July, and finally subsided with the heavier fall in August.

Altogether 58 places here recorded cholera; 43 of them returned less than 5 deaths each, and in 26 of these there were only single deaths. About 1245 persons went hence to the Hardwar fair, of whom only 1 died of cholera on his return thence.

Simla.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	2·23	6·13	0·74	7·42	7·38	2·79	14·48	15·59	2·44	0·18	0·00	0·00	59·38
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·50	1·35	5·27	0·38	0·14	8·98	18·36	30·67	4·81	0·07	0·00	0·50	71·03
	Cholera .	...	...	...	13	13	1	49	28	4	...	...	...	108

Here in the hills the conditions are different to those in the plains. The lighter rainfalls in April and May 1879 following a heavier fall in March were, as in the plains, attended with epidemic cholera activity. In June a heavier fall following, the disease was suddenly checked, but in July and August, with unusually heavy falls, the disease resumed activity, contrary to what has been observed under similar sequence of events in the plains. The explanation appears to be, that the rainfall on the hills very rapidly runs down their steep slopes, and does not so permanently saturate the soil as on the plains would be the case with a proportionally heavy downpour. In such case the greater fall in July and again in August would merely afford more than the ordinary amount of moisture for evaporation from the soil, and hence the more active cholera in those months. But the notable feature

in the monthly distribution of the rainfall of 1879 is the drought in April and May. Of the total 108 deaths, 84 occurred in the Simla Sanitarium, where the rainfall is registered.

Only 9 places in this district recorded cholera, and of these 5 returned only single deaths, all in travellers—the first 2 on the 23d and 29th April, and the other 3 on the 1st, 2d, and 3d May. In the staging town of Kalka, at the foot of the hills, there were 14 deaths, 5 in April and 4 in May.

Jullundur.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	0·50	2·60	0·10	1·30	4·30	0·50	9·30	23·20	1·00	0·00	0·00	0·00	42·80
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·00	2·10	0·00	0·00	4·70	5·30	6·20	0·00	0·00	0·00	0·80	19·10
	Cholera .	...	...	...	37	29	9	6	4	...	...	1	1	87

Here, whatever the cause of the mild prevalence of the cholera of 1879, its appearance in activity in April and May and subsidence in the subsequent months correspond exactly with what we have seen to obtain in the other plain districts already noticed under similar conditions of the seasonal distribution of the rainfall.

Only 19 places here recorded cholera, and in 15 of them the deaths were less than 5 each. About 2344 persons went hence to the Hardwar fair, of whom 4 died on the way there, and 19 on the return journey.

Hoshiarpur.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	1·90	3·30	0·20	2·20	3·30	0·80	8·20	26·40	1·70	0·00	0·00	0·10	48·10
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·10	0·10	1·80	0·00	0·00	10·50	3·60	5·50	0·70	0·00	0·00	0·90	23·20
	Cholera .	...	...	...	20	10	27	11	13	1	...	...	...	82

Here, as in the Jullundur district, the cholera of 1879 was very mildly prevalent, but it followed precisely the same seasonal course with the rainfall as in that district.

Only 25 places here recorded cholera, and in 20 of them the deaths did not exceed 4 each. About 2890 persons went hence to Hardwar fair, of whom 68 died from "all causes" on the return journey, but how many from cholera is not known. In Hoshiarpur town, population 13,138, only 3 cholera deaths were recorded, all in residents, and in the first half of May. In the village of Purhiran, population 209, distant 3 miles from Hoshiarpur, 13 cholera

deaths were registered and 27 cases reported. At the time of this outbreak "the atmosphere was very dull and oppressive at Hoshiarpur, the thermometer ranging from 66° to 90° in the shade; the wind moderate in force, east and south-east, but very sultry towards evening. No rain, thunder, or lightning when the outbreak took place."

Kangra.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	2·40	8·50	1·30	4·30	11·20	0·50	35·50	66·80	9·30	1·60	0·00	0·00	141·40
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·30	0·70	10·70	0·20	0·40	17·50	47·70	62·30	20·10	0·00	0·00	2·80	162·70
	Cholera .	...	...	...	98	52	35	156	1,370	323	12	2	...	2,048

The rainfall is that measured at Dharamsalla Hill Sanitarium, the cholera mortality is that registered in the whole district. The district is everywhere traversed by ridges and spurs at the base of the great range of Himalaya which forms its north boundary, so that what I have suggested in the case of Simla applies here also. The points to notice in the case of 1879 here are the commencement, as everywhere else in the province, of the epidemic cholera of the year during the drought of April and May following upon the unusually heavy rainfall of March, the check to the disease by the first heavy fall in June, and its revived epidemic activity under the greatly heavier falls in July and August. This last relation of cholera activity and rainfall is apparently the direct reverse of what is noticed on the plains. But if we take into consideration the peculiar and very different physical aspects of the Kangra district, a submontane tract traversed in all directions by numerous perennial streams and drainage gullies, and consisting of a coarse stony, gravelly, or sandy soil, with here and there beds of stiff clay or sandy loam, and, further, as receiving a very unequally distributed rainfall in its different parts, we shall at once see that the comparison of the rainfall and cholera mortality in this district with the same elements in the districts on the plains is not a comparison on equal terms, and that some allowance must be made for the different conditions obtaining in the different territorial areas. The divergence from the ordinary course which is shown in the case of this Kangra district during the months of July, August, and September is capable of explanation by the fact that the rainfall at Dharamsalla, which is notoriously the heaviest in the whole province always, does not represent that of the district fairly; for, whilst the monsoon rain-clouds, arrested by the great perpendicular wall of the Himalaya, rising to some 15,000 feet immediately from the valley, are pouring down their water upon the Dharamsalla station, situated on a spur some 4000 feet up the side of the Himalayan mountain barrier, the other parts of the valley and lesser ridges receive a very small share, and may get none at all. Under these circumstances the revival of the epidemic cholera during July and August, after the first burst of the monsoon in the preceding month, may indicate, as the very heavy falls seem to show, that the higher hill-range received the bulk of the season's supply, and that the rest of the district, during these two months at least, received less than the usual amount

of rain. If this were really the case, then the revived activity of cholera here during July and August was in the ordinary course as observed in the districts in the plain, and not the direct reverse of it, as at first sight appears.

Altogether 147 places in the Kangra district recorded cholera. About 3267 persons went to the Hardwar fair, of whom 111 died, viz., 11 on the way there, 14 at the fair, and the rest on their return journey, all, with one exception, from cholera.

Amritsar.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	1·70	2·40	0·30	2·60	2·30	0·40	8·90	12·80	1·50	0·00	0·00	0·00	32·90
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·00	1·00	0·00	0·40	5·20	1·60	7·20	1·10	0·00	0·00	2·30	18·80
	Cholera .	...	1	...	196	216	116	148	134	47	8	...	2	868

Here, as in the other plain districts already noticed, the cholera of 1879 broke out into epidemic activity in April during drought after rainfall in March. The subsequent course of the epidemic was quite in conformity with the rainfall, as has been before explained.

Altogether only 71 places here recorded cholera, and in 52 of them the number of deaths did not exceed 5 each. About 15,400 persons went hence to Hardwar fair. The mortality among them is not known, but is believed to have been very small, as they travelled most of the way by railway; 120 pilgrims, however, are known to have died in the city after return from Hardwar. Of the total 868 cholera deaths registered in this district 524 occurred in Amritsar city alone. This is considerably less than the mortality registered in previous epidemics; thus in 1875 the deaths amounted to 1269, in 1869 to 3608, and in 1867 to 3561.

Gurdaspur.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	1·10	3·90	0·00	1·60	3·70	0·50	3·30	6·10	0·90	0·00	0·00	0·00	21·10
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	1	1
1879.	Rainfall .	0·00	0·00	1·70	0·00	0·00	8·60	4·30	6·70	0·80	0·00	0·00	0·80	22·90
	Cholera .	1	...	1	11	3	...	...	1	3	...	...	...	20

This district was very mildly visited by cholera, but what there was appeared precisely in the same relation to the rainfall as in the other plain districts we have considered up to this. In fact, there was no epidemic here;

only 14 places recorded the disease. About 1950 persons went hence to the Hardwar fair; of these 12 died going and 28 returning.

Sialkot.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	1·12	2·92	0·26	2·55	2·91	1·49	5·87	11·42	1·35	0·44	0·00	1·02	31·35
	Cholera .	...	2	...	...	...	...	...	...	...	...	...	...	2
1879.	Rainfall .	0·00	0·06	1·93	0·00	0·15	6·69	6·19	9·16	1·10	0·00	0·00	0·38	25·66
	Cholera .	3	...	...	11	11	9	...	4	3	...	1	...	42

There was no epidemic cholera in this district in 1879, but what there was pursued the ordinary course in relation to the rainfall.

Only 12 places recorded cholera, and 3 of them returned only single deaths. About 2709 persons went hence to the Hardwar fair, of whom 13 died of cholera on their way back. In Sialkot town only 5 cholera deaths were registered, in Auliapur 10, in Kotla 9, &c.

Lahore.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September	October.	November.	December.	Totals.
1878.	Rainfall	0·20	2·46	0·19	1·45	1·77	0·36	5·96	8·03	0·33	0·00	0·00	0·13	20·88
	Cholera	...	1	...	...	...	...	...	...	...	...	...	...	1
1879.	Rainfall	0·00	0·01	1·32	0·00	0·01	5·48	1·13	7·49	3·12	0·17	0·00	0·45	19·18
	Cholera	...	1	1	16	350	657	468	151	20	8	...	1	1,673

Here the epidemic of 1879 breaks out in April during drought after rain in March, and continues to increase till the heavy rain of August, and thereafter subsides—all in the normal course.

Altogether 289 places recorded cholera, and in 227 of them the deaths did not exceed 5 each. About 2152 persons went from this district to Hardwar; of these 16 died at the fair, and 16 on the return journey, but how many were cholera deaths is not known. Lahore city registered 64 deaths, the suburbs 34, Kasur 22, the village of Gariála, population 2021, registered 93 deaths in May and June; Luliani, population 1000, returned 69; Wán, population 228, had 62; Rajoki, population 547, had 43; and Dasowal, population 1473, had 49 deaths.

Gujranwala.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·70	4·10	0·20	1·70	1·80	1·30	7·70	8·00	1·60	0·60	0·00	0·20	27·90
	Cholera	...	1	...	...	...	...	...	...	...	1	...	...	2
1879.	Rainfall	0·00	0·00	0·90	0·00	0·00	5·10	2·90	5·50	0·80	0·00	0·00	0·70	15·90
	Cholera	...	...	...	2	57	84	185	74	28	...	...	...	430

Mark here the increase of cholera activity in July 1879 with light rainfall following heavier in June, and its decline with the heavy fall in August, and continued activity with the lighter fall in September.

Altogether 66 places recorded cholera, in 42 of which less than 5 deaths each were returned. Wazirabad returned 16 deaths, the first on 1st May; Gujranwala 9, the first on 21st April; two other municipal towns returned only single deaths, a third only 2, and two others 6 and 5 respectively. About 1556 persons went hence to Hardwar fair, of whom 5 died of cholera in going and 9 in returning. A very large proportion of the cases of cholera recorded in this district occurred in travellers or in villagers going from one place to another. There were altogether 936 seizures and 430 deaths reported.

Ferozepore.—The monthly rainfall and cholera mortality in 1878 and 1879 were as folllows :—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·40	0·40	0·00	2·40	2·10	0·70	3·90	7·10	0·00	0·00	0·00	0·20	17·20
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·70	0·70	0·00	0·00	1·10	1·20	4·60	2·30	0·00	0·00	0·60	11·20
	Cholera	...	...	...	3	394	1,271	262	16	1	...	...	...	1,947

Here the epidemic cholera of 1879 pursued the same course in relation to the rainfall as in the other plain districts already noticed. Mark the increased activity of cholera with light showers in June after drought in April and May, and subsidence of the disease with heavy rain in August after showers in June and July.

Altogether 309 places here recorded cholera, of which 230 returned less than 5 deaths each. The town of Ferozepore, population 15,168, returned 13 cholera deaths; Muktsar, population 2983, returned 37—the first in Ferozepore on 5th June, and in Muktsar on 6th June. Four other municipal towns were affected, but 2 of them returned only single deaths, another only 2, and the other 4. Many of the villages suffered very severely; in 24 of them the aggregate mortality registered was 778 deaths. In the hamlet of Lobianwala there were 115 deaths, in Kadirwala 85, in Kot Bhai 55, in Sukhiya 53, and so on with some others. Much of this arid sandy tract is irrigated by hot-weather inundation canals. Only 895 persons went hence

to the Hardwar fair, of whom 20 died on the return journey. This district is not on any pilgrim route.

Rawal Pindi.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·97	4·71	0·37	7·68	5·67	1·10	8·12	6·60	1·95	0·86	0·00	0·00	38·03
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·22	2·29	0·38	0·32	3·65	7·05	15·60	3·06	0·00	0·00	1·25	33·82
	Cholera	...	...	...	50	533	1,157	859	257	52	6	...	...	2,914

Here again the epidemic cholera of 1879 begins in April with light showers and drying up after the rains in March, increases with the light fall in June, abates with the more abundant fall in July, and subsides with the unusually heavy rain in August.

Altogether 601 places in this district recorded cholera, and altogether 4777 seizures were reported. About 1700 persons went hence to the Hardwar fair, of whom 4 died of cholera in going and 78 in returning. Next to the Hissar district comes Rawal Pindi in respect to prevalence and severity of cholera in 1879. Rawal Pindi town registered 163 deaths, the first on 21st April; Murree Sanitarium, 57, the first on 7th May; Pindigheb 49, the first on 8th June; and Attock 7, the first on 7th July.

Jhelum.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·50	1·80	0·00	2·20	1·50	1·00	13·00	3·50	2·10	0·70	0·00	0·00	26·30
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·00	2·60	0·10	0·00	7·50	6·10	10·80	1·60	0·00	0·00	0·70	29·40
	Cholera	...	...	...	124	542	760	224	150	140	22	...	...	1,962

The same remarks apply here as in the preceding illustrations. Mark the continued activity of cholera with the light rainfall of September 1879 following the heavy fall in August.

Altogether 293 places here recorded cholera, and 2843 seizures were reported. About 1300 persons went hence to the Hardwar fair, of whom 49 died. Jhelum town registered 199 deaths, the first on 22d April; Pindadan Khan only 6, the first also on 22d April; Talagang 5, the first on 17th May; Chakwal 3, the first on 10th June. Some of the villages suffered very severely. Choya Marum, population 2296, registered 196 deaths; Chinji, population 1309, returned 113; Jhanta, population 1009, had 50; and Bhelomar, population 780, had 47. The high cholera mortality in this dis-

trict is described by the civil surgeon as due to the great overcrowding of men and animals in Jhelum during the year, to the high prices of the necessaries of life, and to the influx of many starving refugees from Kashmir.

Gujrat.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·90	3·30	0·30	2·40	1·10	0·30	9·20	8·40	3·00	0·60	0·00	0·60	30·10
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·00	1·90	0·00	0·00	7·90	2·60	11·00	0·50	0·00	0·00	0·40	24·30
	Cholera	1	...	...	...	90	212	27	26	24	...	...	...	380

Here no cholera was recorded in April 1879, though the district is traversed by the Grand Trunk Road from Lahore to Peshawur, and the high-road to Kashmir branches off at the town of Gujrat. Possibly the delayed appearance of cholera here may be due to some local depression of the temperature.

Altogether only 59 places recorded cholera. About 1969 persons went hence to Hardwar, of whom 11 died of cholera on their way there—13 at the fair, and 26 on the way back. A death from cholera was reported on 29th April in the village of Chaman, and another on the next day at Dinga, the victim in the latter instance being "a traveller;" but the first registered death was on the 2d May in Gujrat town, where altogether 24 deaths were registered; in Jalalpur, population 14,014, there were 21, the first on 10th May; in Dinga, population 5086, there were 15, the first on 30th May, excluding the case of the stranger reported on 30th April.

Shahpur.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	0·40	9·30	0·30	0·90	3·50	0·00	3·70	4·60	6·60	0·00	0·00	0·00	29·30
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·00	2·10	0·00	0·00	0·90	0·80	6·60	0·20	0·00	0·00	0·00	10·60
	Cholera	...	...	...	...	8	92	56	16	6	...	...	...	178

Here the cholera of 1879 pursued much the same course as in the district of Gujrat, which adjoins it to the south-west.

Altogether 33 places here recorded cholera, of which 24 returned less than 4 deaths each. About 465 persons went hence to Hardwar, of whom 2 died of cholera at the fair, and 2 on their way back.

Peshawur.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	1·99	2·77	0·17	3·86	3·76	0·00	2·07	11·34	0·13	0·23	0·00	0·00	26·32
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·46	2·73	0·24	0·14	0·05	0·47	0·97	0·16	0·00	0·10	0·52	5·84
	Cholera	...	...	...	...	383	216	261	51	56	32	3	...	1,002

Here the cholera of 1879 breaks out in epidemic violence in May with light showers after the heavy rain in March, and continues active with light showers in the succeeding months. For the purpose of comparison I produce here the corresponding returns for the previous occasions on which the Peshawur district has been visited by epidemic cholera, viz., 1876, 1872, 1869, and 1867.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1875.	Rainfall	0·00	3·30	1·40	0·00	0·80	0·00	4·90	4·60	0·40	1·00	1·50	0·70	18·60
	Cholera	...	1	...	...	...	...	1	...	...	...	...	...	2
1876.	Rainfall	0·20	0·80	2·80	1·20	0·00	0·50	2·10	2·80	0·30	1·00	1·60	0·00	13·30
	Cholera	...	...	...	...	...	...	...	...	61	510	67	...	638
1871.	Rainfall	0·10	5·00	0·40	1·40	0·00	0·70	3·10	0·00	0·00	0·00	0·00	0·60	11·30
	Cholera	...	...	...	2	...	...	1	1	...	...	...	...	4
1872.	Rainfall	1·50	0·70	2·10	2·20	1·70	0·10	2·70	5·10	0·40	0·00	0·00	0·00	16·50
	Cholera	...	...	1	...	1	1	...	2	1	310	76	...	392
1868.	Rainfall	0·30	0·20	2·30	3·60	0·40	0·00	0·50	0·00	1·00	0·00	0·00	3·40	11·70
	Cholera	...	2	2	...	3	4	1	1	...	...	3	1	17
1869.	Rainfall	1·70	0·90	2·30	0·20	0·00	0·70	0·00	0·90	7·00	1·60	0·00	0·00	15·30
	Cholera	...	...	1	6	4	1	...	2	1,704	1,155	99	13	2,985
1866.	Rainfall	0·80	1·30	3·80	0·50	0·70	0·00	0·00	1·30	1·20	0·00	0·00	0·00	9·60
	Cholera	2	1	...	1	...	2	1	2	1	1	2	...	13
1867.	Rainfall	0·00	0·50	0·40	2·70	0·80	0·00	0·00	3·10	0·00	0·00	0·00	0·40	7·90
	Cholera	1	...	...	5	281	990	357	188	68	19	...	...	1,909

In each of these instances of epidemic cholera we find the disease active

either during periods of drying up after preceding rainfall, or during periods of rainfall after preceding drought more or less pronounced.

In the cholera of 1879 altogether 138 places recorded the disease, but in 103 of these the deaths did not exceed 4 in any one, and in 59 of them there were only single deaths. Only about 200 pilgrims went hence to Hardwar fair. The first batch of returning pilgrims left Hardwar on the 12th April, and arrived at Peshawur on the 19th April. The first case of cholera detected in this district occurred on the 28th April in a pilgrim at the Attock bridge over the Indus. In the city of Peshawur the first cholera case observed was that of a Hindu female on the 1st May. She "had not been to Hardwar, nor, as far as could be found out, had any communication with pilgrims." She died the same day. On the 2d May a Hindu car-driver, who had conveyed pilgrims from Jhelum to Peshawur on his car, was seized with cholera at Peshawur the day after his arrival. The next case was that of a city prostitute, and the next that of a Hindu lad, who was taken ill on the 3d May. After that date cholera became general all over the city, as well as over the district generally, and on the road to Kabul. In Peshawur city 478 cholera deaths were registered, or nearly half the entire mortality registered from the disease in the whole district.

Hazara.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	3·30	9·50	1·20	5·50	7·60	0·50	4·40	13·50	1·50	1·30	0·00	0·00	48·30
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·40	5·80	0·30	1·20	3·70	7·40	12·10	2·60	0·00	0·00	2·20	35·70
	Cholera	...	...	...	1	156	238	225	77	78	6	...	...	781

Here again the epidemic cholera of 1879 begins activity during the drying up after rain in March, increases with the showers in June and July, and abates with the heavy fall in August, but continues active with the light showers in September.

Altogether 228 places here recorded cholera; of these 194 returned less than 5 deaths each, and 102 of them only single deaths. About 582 persons went hence to Hardwar, of whom 1 died of cholera in going there, 6 at the fair, and 27 on the return journey. The town of Haripur returned 45 deaths, the first on 30th April; Baffar, population 4494, had 24, the first on 2d June. Cholera appeared in this district some five or six days before the arrival of the returned pilgrims. The Abbottabad town, population 1194, had 4 deaths, the first on 27th June; the cantonment adjoining, population 2894, had only 3, the first on 18th July.

Kohat.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall	1·90	1·60	0·10	2·00	2·20	0·10	7·00	8·30	0·10	2·60	0·00	0·00	26·40
	Cholera	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall	0·00	0·40	2·30	0·00	0·00	0·80	2·40	2·80	1·50	0·00	0·00	0·60	10·80
	Cholera	...	1	...	...	21	323	103	108	85	1	...	...	642

Here once more we find the epidemic cholera of 1879 beginning activity during the drying after rain in March, and increasing with light showers in the succeeding months.

Altogether 107 places here recorded cholera, of which 77 returned less than 5 deaths each. Only 82 persons went hence to Hardwar, of whom 1 died on the journey. Several places in this district suffered severely from cholera; Kohat town, population 11,043, registered 115 deaths, the first on 21st May; in the Cantonment, population 5210, there were 8, the first on 23d May; Hangu returned 44, Darsamand 39, and in 10 other villages the deaths ranged between 10 and 20.

Bannu.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	1·30	1·80	0·20	3·30	3·60	0·60	0·50	3·60	0·60	0·00	0·00	0·00	15·50
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·20	5·90	0·00	1·80	1·00	0·90	4·70	0·00	0·00	0·00	0·10	14·60
	Cholera .	...	...	...	...	...	1	73	53	3	35	...	...	165

Here we see the cholera of 1879 beginning in June—the hottest month in the year—with light showers after heavier ones in May, increasing with lighter showers in July, and abating with the heavy rain in August, but again breaking out temporarily during the drought in October.

Altogether 22 places here recorded cholera; in 19 of these the deaths did not exceed 5, and 11 of them had only single deaths. Bannu town registered 25 deaths, the first on 6th July; the cantonment, Edwardesabad, 16, the first on 18th June. Some of the villages suffered very severely; Haved had 49 deaths, and Vali 24. The first few cases observed were in travellers. The reappearance of the disease in October was in some previously affected places.

Jhang.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	0·90	1·00	0·00	0·70	1·60	0·00	2·40	6·50	0·30	0·00	0·00	0·00	13·40
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·00	0·90	0·00	0·00	1·40	1·00	0·60	0·30	0·00	0·00	0·00	4·20
	Cholera .	...	...	...	...	...	7	144	84	3	4	...	...	242

Here again the cholera of 1879 begins with rain after drought, and continues active with the lighter falls in the succeeding months.

Altogether 33 places here recorded cholera. About 264 persons went hence to the Hardwar fair, and 8 of them died on the return journey. The disease was most severe in the 3 following places, viz. :—Jhang, pop. 8609, where 61 deaths were registered; Maghiana, population 13,618, where there were 82; and Harsan Khan village, which had 34. Regarding the first case at Jhang the civil surgeon reported—"The first person attacked went to sell curds at Maghiana" (3 miles distant) "on the 29th June, and returned to his house about 1 P.M. in an exhausted state. On arriving at his house he ate melon and drank buttermilk; a little while after he was attacked with vomiting and purging."

Montgomery.—The monthly rainfall and cholera mortality in 1878 and 1879 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1878.	Rainfall .	0·00	0·40	0·00	1·20	2·20	6·50	6·50	7·40	0·00	0·00	0·00	0·00	24·20
	Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
1879.	Rainfall .	0·00	0·00	1·40	0·00	0·10	1·10	0·20	2·40	0·00	0·00	0·00	0·00	5·20
	Cholera .	...	...	...	2	15	20	41	22	1	...	...	...	101

Here also the cholera of 1879 appears during drought after rain, and increases during light showers in the hottest months of the year.

Altogether only 37 places here recorded cholera; in 31 of them the deaths did not exceed 5, and in 20 of these there were only single deaths. In the village of Chichawatni, situated on the left bank of the Ravi, 2½ miles from the railway station of the same name, 26 cases and 16 deaths were reported. Regarding this outbreak the following particulars are recorded:—These 26 cases occurred in 18 different parts of the village. The first 2 cases occurred on the 24th April, in the persons of pilgrims from Hardwar; one, a Hindu male, arrived in the village on the 23d April, was taken ill in a house in the middle of the village on the 24th, and was removed to Mooltan district on the 27th, still suffering; the other was a Hindu female, who was *en route* to Dera Ismail Khan, and had put up at the village for the night;

she was taken ill in the market, in the centre of the village, on the 24th, and died on the 25th.

The next 5 cases occurred on the 28th April; 2 of them were the wife and mother-in-law of the first case, and were taken ill in his house. They both, as well as the first case, who was removed to the Mooltan district, recovered. The next 3 cases were Muhammadan females who lived in two separate houses on the west side of the village. One died on the 1st May; the others recovered. The one who died had attended on the woman who was going to Dera Ismail Khan and died in the market, and had received the deceased's cast-off clothes; the two who recovered were her own sisters. Another case occurred on the 29th in a house near that occupied by the first case, removed to Mooltan; the patient, a Hindu female, recovered. Her mother, living in the same house, took cholera on the 4th May and died on the 6th; and a Hindu male in a neighbouring house was attacked on the 3d May. Three other cases occurred in three different houses on the same (west) side of the village. One was a Muhammadan prostitute who lived on the east side of the village, but had visited the second case on the night of her arrival; she died the next day. Another was a Muhammadan male; he recovered; and the other was a Hindu female; she died on the 9th May. On the 4th May a Hindu male in a neighbouring house was attacked; he died on the 9th. Both these Hindus were visitors at the house of the first case, removed to Mooltan. On the 5th May there was 1 case, a Muhammadan male, who also lived on the west side of the village; he died on the 13th. On the 6th May a Muhammadan female, living on the east side of the village, was attacked, and died the next day. She had attended the prostitute during her illness. On the 7th May there were 4 cases, 3 in one house and 1 in another, both of which were on the east side of the village. The first 3 were a father and his two sons. The father died the same day, the sons on the 12th and 14th respectively. The father had been called by the prostitute to receive her dying directions regarding the disposal of her property, &c. The other case was also a Muhammadan male; he died the next day. He had been employed in rubbing the hands and feet of the prostitute during her illness. On the 8th May there were 3 cases, all Muhammadans, two females in one house, one male in another, both on the east side of the village. The two first died the next day; the other recovered. The two females were mother and daughter, neighbours and visitors of the man who had been called to receive the prostitute's dying directions. On the 11th May there was 1 case, a Hindu, in a house in the middle of the village; he died on the 13th. On the 15th May there were 2 cases, both Hindu males, one in a house in the middle of the village, the other in a house on its west side; one recovered, the other died on the 17th May.

Such in substance is the account given by the civil surgeon to prove the importation of the disease by pilgrims and its spread by contagion. The village, it was stated by the inhabitants, had not been visited by cholera for the previous twenty years. It is not stated how many persons went from this district to Hardwar, nor is any account given of the appearance of the disease in the other 36 places affected. The first death from cholera reported in this district occurred at the town of Kamalia, about 14 miles distant from Chichawatni across the river, on the 23d April, and another on the 25th, and they were the only cholera deaths registered in that town.

This completes the notice of the several districts in this province visited by epidemic cholera in 1879. A few stray cases were reported from the other four districts constituting the area usually exempt from cholera in this province, and distinguished for the aridity of its climate and scanty annual rainfall, viz., the districts of Mooltan, Muzaffargarh, Dera Ismail Khan, and Dera Ghazi Khan. For the purpose of comparison with the other districts already noticed, I give here for each of these districts separately the monthly rainfall and cholera mortality in 1878 and 1879:—

			January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Mooltan.	1878.	Rainfall .	0·00	0·70	0·00	0·50	0·20	0·40	3·40	4·70	0·00	0·40	0·00	0·00	10·30
		Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
	1879.	Rainfall .	0·00	0·00	1·73	0·00	0·00	1·32	0·81	1·03	0·00	0·00	0·00	0·00	4·89
		Cholera .	...	...	...	...	2	...	...	...	...	...	...	...	2
Muzaffargarh.	1878.	Rainfall .	0·00	0·20	0·00	0·80	0·20	0·70	1·50	6·70	0·00	0·00	0·00	0·00	10·10
		Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
	1879.	Rainfall .	0·00	0·00	1·10	0·00	0·00	1·40	0·00	0·00	0·00	0·70	0·00	0·00	3·20
		Cholera .	...	...	...	...	...	...	...	...	1	...	...	...	1
D. I. Khan.	1878.	Rainfall .	0·22	1·55	0·23	2·62	1·12	1·50	2·65	6·29	0·03	0·00	0·00	0·00	16·21
		Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
	1879.	Rainfall .	0·00	0·00	1·55	0·00	0·16	0·18	2·06	1·07	0·10	0·00	0·00	0·04	5·16
		Cholera .	...	...	...	...	...	...	...	4	9	9	...	16	38
D. G. Khan.	1878.	Rainfall .	0·00	0·50	0·00	0·60	0·50	1·10	3·20	2·40	0·00	0·00	0·00	0·00	8·30
		Cholera .	...	...	...	...	...	...	...	...	...	...	...	...	...
	1879.	Rainfall .	0·00	0·00	1·50	0·00	0·00	2·00	0·05	0·85	0·00	0·05	0·00	0·00	4·45
		Cholera .	...	...	...	...	...	...	...	1	...	...	...	...	1

In these districts the cholera of 1879 in Dera Ismail Khan shows the only approach to the semblance of epidemic activity, and here, as in the former cases illustrated, the appearance of the disease is during the drying up under light showers of the heavier rainfall in July. In December again the disease appears attended with light rain, though at this season of the year the occurrence of either one or the other is an altogether exceptional circumstance in these parts.

We have now traced the course of the epidemic cholera of 1879 through each of the 32 districts of the Punjab, and it is clear from what has been recorded that there is no ground for the generally held opinion that the cholera of that year in this province was propagated by the pilgrims returning to their homes from the great *Kumbh Mela* at Hardwar; for had they been the carriers of the disease we should have found it wherever they went after leaving Hardwar, instead of which we find only that pilgrims themselves suffered from the disease, not only on returning from the fair, but also on their journey to attend it, and this in common with the people of the districts they passed through, and only in those places which were within the limits of the area of epidemic influence. Moreover, although in some instances the pilgrims affected by the disease had in their return journeying passed beyond the epidemic area within which they had contracted cholera, yet nowhere did they spread the disease or give rise to any general outbreak of cholera in the outside areas which they traversed. From a list of 67 recorded cases of cholera among passengers on the Sind, Punjab, and Delhi railway, which

extends from Delhi *viâ* Lahore to Mooltan, between the 15th and 30th April 1879, the time during which pilgrims were returning by railway from Hardwar, all but one were taken out of the trains at different stations between Delhi and Lahore, which tract of country, as will be seen by the district cholera mortality given in Table No. I., was within the epidemic area of the disease; the one exceptional case was taken out of the train at Mooltan on the 20th April, that station being outside the epidemic area. In another list of 14 cases among railway employés on the same line, no single case occurred on that part of the line between Lahore and Mooltan.

On the contrary, it appears clear, from the uniform agreement of the recorded statistics in showing a regular series of consecutive events relating to rainfall and cholera prevalence, that the epidemic cholera of this year (as indeed of all the preceding years in the series of twenty with which this history deals, and not in the Punjab only, but also in all the other provinces of India) was dependent for its origin and diffusion upon the fact of the climatic conditions of the areas in which it prevailed being favourable to the development of the activity of the disease. So far as the evidence afforded by the multitudinous instances recorded in the preceding pages goes, the nature of the climatic conditions always found favouring the development of cholera activity is characterised by the presence of evaporation, more or less free, of moisture from the surface of the soil under a certain high degree of the atmospheric or telluric temperature, or more probably a combination of both, as a prime factor in the causation of cholera. We have seen illustrated in numerous instances on the preceding pages, both in detailed and summarised statistics, the uniformly repeated coincidence of evaporation of moisture from the surface of the earth after rainfall and the prevalence of epidemic cholera. In some instances the coincidence is observed to occur after light rainfall on a soil parched by drought, in other instances after drought on a soil saturated by heavy rainfall. In both instances the case is one and the same, namely, evaporation of moisture, under a certain high degree of temperature, from the surface of the soil. In the pages immediately preceding I have illustrated this sequence of events by detailed statistics for each district of the province, and I now proceed to describe the summarised statistics for the province as a whole in conformity with the rule I have observed in the history of the several preceding years, so as not to break the uniformity of method adopted in treating this subject. It will be seen how closely the summary account confirms the detailed in respect to general results.

The rainfall of 1879 was 23.56 inches, or $3\frac{8}{10}$ inches less than the average, and about $7\frac{1}{2}$ inches less than the fall in the preceding year (see Table No. V.) Its seasonal distribution was such as to produce drought in the first quarter, an average fall in the second, a defective fall in the third, and drought again in the fourth. The points of interest in relation to cholera are—(*a.*) the plentiful supply of the second quarter falling upon a soil parched during the first; (*b.*) the defective supply of the third quarter falling upon a still thirsty soil during the hottest portion of the year; and (*c.*) the effect of these conditions of soil and rainfall in favouring free evaporation of moisture from the surface soil. In the first quarter of 1879 the rainfall was only 2.45 inches, or more than $1\frac{1}{3}$ inch less than the average for this portion of the year. It followed, moreover, an extraordinary deficiency in the preceding quarter, the last of 1878, in which the defect was by nearly 1 inch of the average, and fell, besides, almost entirely in the last month of the quarter, the fall in March being 2.16 inches against 0.24 in February and

0.05 in January. In the second quarter the fall was 4.61 inches, or only 13 cents. above the average, and it fell almost entirely in the last month of the quarter, the fall in June being 4.38 inches against 0.18 in May and 0.06 in April. It was in April, during the drying up of the rainfall in March, that the epidemic cholera of the year burst out (see Table No. II.); the plentiful fall in June somewhat quenched the soil, and the successive good falls in the third quarter gradually saturated it. The rainfall in the third quarter was 15.66 inches, or more than $1\frac{8}{10}$ inches less than the average; more than half the quantity, or 8.68 inches, fell in August, leaving 5.16 for July and 1.82 for September. The heavy fall in August saturated the soil, and the light fall in September, with a declining temperature, merely prolonged the state of saturation; and with these conditions the epidemic cholera rapidly subsided. The fall in the fourth quarter was only 0.84 inch, or more than half an inch less than the average; its effects, however, belong to the history of the next year.

The food-supply in 1879 was very scarce, and famine prices prevailed generally in the province, more especially so in its western half; the average price of wheat was as high as 12.46 sers the rupee; but in many of the western and northern districts between 6 and 8 sers only could be got for the rupee during many months.

1880.—In this year, the last of the triennial cycle, the periodic cholera epidemic which commenced its cyclic career in 1878 and prevailed with irregular severity in 1879 ran its course, and in due order subsided to minimum prevalence. The death-rate of the year among the troops and jails was 1.28 per mille of strength, and among the civil population only 0.01 per mille. This marked subsidence in the activity of cholera in 1880 was coincident with a continuation of scarcity and famine rates of food, and with a continued deficiency in the rainfall, the seasonal distribution of which corresponded very closely with that of the rainfall of the preceding year.

Among the European troops, total average strength 13,562, there were altogether 57 admissions and 44 deaths from cholera, giving a death-rate of 3.24 per mille of strength. Of the 24 stations occupied by these European troops the 4 following recorded cholera in 1880, viz.:—Rawal Pindi, strength 1423, admissions 2 and deaths 0; Nowshera, 770, 1 and 1; Peshawur, 1289, 13 and 12; and on the march, ?, 41 and 31, respectively. Of the 57 admissions, there were 44 in September and 13 in October.

The incidence of cholera in 1880 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

Among the civil population throughout the province the total of cholera deaths registered amounted only to 274, and of this number 167 occurred in Peshawur district, 31 in Rawal Pindi, and 14 in Lahore (see Tables Nos. I. and II.) The great epidemic cholera of the preceding year had completely subsided in October of that year; and with the exception of a small local outbreak in December on the Afghanistan frontier of the Dera Ismail Khan district, the year 1879 closed with only 4 sporadic cases of cholera registered in the whole province during its last month. The year 1880 opened with the same clearly marked quiescence of cholera in this province, only a single death from the disease being registered in January. During the succeeding months up to July inclusive single deaths were registered in many of the districts covered by the preceding year's epidemic, but nowhere was there any sign of epidemic cholera until some local outbreaks of the disease occurred in two of the north-western districts during August and September,

and these were of no great dimensions. The year, in fact, as regards cholera, was non-epidemic; yet the records show that in its mild manifestations of activity the cholera of 1880 in this province followed the general rule of its seasonal advance in epidemic years; that is to say, making a start in increased prevalence in April, it reached its culminating point in June, and began to subside in July, when the local outbreak in the Peshawur and Rawal Pindi districts occurred, and gave a second culminating point in October. The figures in the mortality returns show that the bulk of the cholera deaths of the year occurred in the north-western districts of the province; and they show also that the disease developed its activity in that direction from very small beginnings, slowly and steadily and imperceptibly advancing from the south-eastern districts in the track of the usual progress of cholera in this province. Up to the month of July inclusive the greater portion—36 out of 49—of the deaths registered were reported in districts eastward of the River Ravi, and only 13 in the districts to the westward of that river. After July the disease was more active in the districts to the north-west than in those to the south-east, in the proportion of 211 to 14 deaths registered in each set respectively; this excess was due to the local outbreaks in the Peshawur and Rawal Pindi districts, which I now proceed to describe.

These sudden manifestations of the activity of the disease in the extreme north-west of the province, contrary to the usual experience, were preceded by no very marked premonitory signs in the districts in the south-east of the province; but the mortality registered from cholera in the Lahore district during the four earlier months ending with July inclusive, viz., 8 deaths out of a total of 14 in the year, the last 6 being in October (5) and December (1), show that the cholera influence was present in that central portion of the province previous to the activity of the disease manifesting itself in the remote north-western districts. It will be seen in the sequel that this manifestation of cholera in the Peshawur district was essentially a local activity of the disease, and that the subsequent appearance of cholera in the Rawal Pindi group of the districts was immediately connected with the movement of large bodies of troops, camp-followers, and travellers passing through them on the march down country from Peshawur, where they had already become affected with cholera.

Peshawur.—Altogether 167 cholera deaths were registered in this district. The first 3 were isolated cases in the months of April, June, and July respectively. Of these the first occurred in the village of Yargaju, population 1145, about 2 miles to the south-east of the Peshawur city, the patient being a woman, aged 25, who died on the 26th April, after five days' illness. The next was in the village of Bedian, population 214, in Razar circle, about 40 miles due east of Tangi and 52 north-east of Peshawur city; it occurred on the 18th June, when a man, aged 60, died after ten hours' illness. The third was in the village of Kangra, population 226, in the Mathra circle, about 24 miles due north of Peshawur city and 13 due south of Tangi; it occurred on the 30th July, when a man, aged 35, died after two and a half days' illness. This village is situated between Peshawur and Tangi, in the Doaba of the Swat and Kabul Rivers, the former separating it from Tangi, the latter from Peshawur. In each of the above cases the subject was a resident, and died in his or her own home; they are instances of sporadic cholera which occur now and again at all seasons of the year in the country villages of most parts of India, and much more frequently than they are ever reported.

The last of the above-reported deaths was followed by the outbreak in Tangi, on the opposite side of the Swat River. The first death in Tangi, population 7269, occurred on the 12th August, and the last on the 1st September; between these dates about 64 seizures were reported and 26 deaths registered, of which latter 9 were in strangers. Between the 18th and 27th August 6 single deaths from cholera were registered in as many different villages, viz., 1 in the Tangi circle, 4 in the adjoining Charsada circle, and 1 in the Katlang circle, under the hills to the north; and from the latter date to the 4th September 3 deaths were registered in the little village of Gandera, about 2 miles eastward of Tangi, all in residents of the village. The particulars recorded in connection with the appearance of the disease in Tangi may be thus summarised:—Tangi is a large straggling village, similar in its general conditions to the other villages in this part of the country; the houses are mostly poor mud-built structures, in which the cattle share the shelter with the family; conservancy is entirely neglected, and dungheaps and cesspools are met with in all directions, with litter scattered promiscuously about the roads and courtyards. The water-supply is from a branch of an irrigation-cut led off from the Swat River, which flows close by, and from wells in which the water lies at from 15 to 60 feet below the surface, according to the ups and downs of the ground; the water in all the deep wells is too brackish for drinking purposes, and "it is believed there is only one sweet-water well" in the village. Tangi is the market-town of the trans-frontier districts of Lower Swat, Utmankhel, and Mahmand, and is consequently much frequented by strangers. At the time of the outbreak there was a large collection of people from beyond the border, who had come to the town with scores of bullocks laden with merchandise, and among the traders were some very poor people who had come in search of labour and food. The first case of cholera is ascertained to have occurred on the 11th August, in a woman who lived in a house on the outside of the village, and was in the habit of being visited by "a great number of coolies and travellers;" she recovered. On the next day, 12th August, 8 seizures and 5 deaths by cholera were reported in Tangi; of these, 2 cases, both fatal, occurred in a hut separated from that occupied by the first case only by a partition wall. On the 13th there were 6 seizures with 3 deaths; on the 14th the seizures were 4 and deaths 3; on the 15th, seizures 12 and deaths 5; on the 16th, seizures 3, deaths 1; and so on. The cases occurred in all quarters of the village, and several of them occurred among strangers and travellers and destitute people. On the 18th August the civil surgeon, on visiting the place, "found two strangers lying in the streets with cholera, who had apparently crawled into the village with the disease upon them;" one was an old man, and the other a boy of 13 or 14 years. "They were utterly unknown to the people, who looked on them with the utmost apathy, and did nothing to help them." He saw also "5 or 6 recent cases, all in the algid or collapse state, and some 4 or 5 more of the earlier ones which had recovered or were recovering." On the 27th August, when, as Sanitary Commissioner for the province, I arrived at the village, I saw 5 of the convalescent cases, no fresh seizures having occurred during the two preceding days. Of these 5 convalescents one was a man and 4 were women; the man and one of the women were residents; the other 3 women were strangers who had come in search of employment and food. I recorded the following notes in connection with these 5 cases:—

The man, aged 26, was said to have been taken ill with cholera when at Peshawur city on the 18th August, and to have been at once brought home to Tangi by his friends. He looked delicate, and had a slight yellow tinge

in the eyes, but was up and about, and showed no signs of emaciation. "His own account of himself was, that he was suddenly taken ill with violent headache and ardent fever, accompanied by a slight diarrhœa and somewhat violent vomiting of bilious matter, which quickly induced a state of collapse or faintness. In this state he was conveyed back to Tangi, and recovered in a couple of days." The other resident of the village was a Hindu woman, aged 25; she "had been taken ill at Tangi on the 18th August with fever, vomiting, and slight purging, which last continued for two days." When seen by me on the morning of the 27th August "she was lying on a cot, was fat and plump, and showed no signs of any recent severe illness; her pulse was natural, and tongue and eyes in good condition; she complained only of weakness, was free from fever, and had no return of vomiting or purging for five or six days. . . . The other 3 cases were in the cholera hospital erected outside the village. Two of them were in very good condition, and had each an infant at the breast. Neither showed any signs of emaciation or recent severe illness, though both had suffered some six or seven days previously from a sudden attack of fever, with some vomiting and purging, which lasted for two or three days. The third woman was in a very weak state and emaciated condition, and was still suffering from a painless watery diarrhœa. She was a beggar from beyond the border, and appears to have been in a state of semi-starvation for some months past. She was in a state of low fever."

From what I had myself seen, and from what I had heard from the people of Tangi and other places in the Peshawur district, I was inclined "to consider this sudden outbreak to be an aggravated form of the common endemic fever of the valley, which is known to be occasionally attended with more or less sudden and violent vomiting and purging, which produce a collapse resembling that of the epidemic and virulent cholera, though usually not of a like fatal character."

The remarkable feature of this outbreak, as brought to notice by the police reports, is its restriction to the one village of Tangi. But this, it would seem, is more apparently than really the case, since several deaths from a similar train of symptoms were said to have occurred in some villages in the neighbouring districts beyond the border, and several isolated deaths from cholera were reported from different villages in the Peshawur valley itself during the same month of August. The last cholera death in connection with the Tangi outbreak was reported on the 4th September in the neighbouring village of Gandera. After this the next cholera death reported in this district occurred on the 18th September in the village of Kedi, in the Swabi circle, and about 20 miles south-east from the village of Bedian, in which a solitary cholera death was reported to have occurred on the 18th June, as before mentioned. The sufferer was a man, aged 40, a resident, who died in his own home after two days' illness. Again, no cholera death was reported in this district till the 26th September, on which date a man, aged 45, died of the disease in the civil dispensary at Peshawur; he was a stranger from Tira, beyond the border, and was taken ill in the city grain-market, whence he was carried to the city dispensary on the 20th September. Prior to this a case of cholera occurred in the city on the 28th August in a Hindu, who was a servant of the Commissariat agent, and had come down from Kabul about ten days before he was attacked by the disease; he recovered. Before this again another case, already mentioned, occurred in the Peshawur city on the 18th August, and was promptly removed to Tangi, where he recovered. The next cholera death reported in this district occurred on the 2d October, also in the Peshawur city; the victim was a

cobbler who used to work in an archway in the grain-market over which the Prince of Bukhara lived. About the same time a few other cases of cholera occurred in the grain-market and in other parts of the city. Following these an outbreak occurred in the family of the Prince of Bukhara and among his followers. The following are the particulars recorded :—

The Prince of Bukhara had been residing at Peshawur for the last nine or ten months. The Prince himself and his personal attendants occupied a double-roofed gateway and the room above the arch of the gateway near the new grain-market, on the east of the square. The Prince's wife and family lived in a house or harem in a by-street a little to the southward of the new grain-market; the followers, grooms, &c., lived in a garden close to the north of the grain-market and in the large street leading to the Bajawari gate of the city; they numbered about 40 men. The rest of the establishment, about 10 in number, lived on the gatway or in the harem. On the 11th October they were all well, except that they had cases of fever.

"That day 30 or 35 of them ate of some *khichri*, served in one tray, the elder son of the Prince eating with them. The Prince himself spent the day in the harem, and ate of the food cooked there. About midnight, between the 11th and 12th October, 9 of the followers, a police-constable on duty at the garden, who had dined with them, and the Prince's son were seized with cholera, of which they all eventually died. On the 13th another child of the Prince was taken ill inside the harem; on the 14th a third, and on the 15th a female attendant were also taken ill and died; 14 cases in all, and all ending fatally. The *khichri* which formed the meal, and after partaking of which the outbreak took place, was made in the usual way from dâl and rice bought in the bazar. All inquiries have failed to show that this *khichri* could have been infected with cholera matter. The cook is alive and well. Only about half of the whole number who ate of it were seized." The Prince's son, on being attacked, was taken into the harem. It was supposed that copper-poisoning from the vessel used in the preparation of the food might have been the cause of the fatal illness of these people, "and the facts of the case are not incompatible with the supposition." (Civil Surgeon's Report.)

Meanwhile cases were daily cropping up in different parts of the city. Sometimes 4 or 5, sometimes 1, and on one day 13, and for three days none were reported. The last death reported in the city—and it was the last in this district also—occurred on the 17th November; altogether 118 deaths were registered in the city of Peshawur, the first on 26th September. While the disease was thus active in the city only 10 cholera deaths were registered in the rest of the district, exclusive of military and jail returns; of these 5 were solitary deaths in as many different villages, three of which lie within a few miles of the city, the fourth on the Grand Trunk Road, 10 miles from the Indus, and the fifth 14 miles due south from the city; the other 5 occurred between the 7th and 11th November in the village of Azakhel, 14 miles south-east from the city. All these 10 cases were residents of the places in which they died.

The details above given of the outbreak among the Bukhariots in Peshawur city are worthy of comparison with a somewhat parallel outbreak which occurred at Delhi in 1871, the particulars of which have been given with the history of the cholera of that year. In both these remarkable outbreaks—that among the tanners at Delhi in November 1871, and that among the Bukhariots in Peshawur in October 1880—there are two parallel sets of circumstances which attract attention.

In each case the outbreak was preceded by the occurrence of cases of cholera in the immediate locality, and in each case the victims of the outbreak had immediately or shortly before partaken of a feast, the food in both cases being of the same kind and cooked in the same sort of tinned copper vessels. What influence may have been due to the quality of the food itself, or to the condition of the vessels in which it was

cooked, in the production of the symptoms which characterised both outbreaks it is impossible to determine with accuracy. Similar instances of sudden sickness are by no means uncommon in the ordinary experience of domestic life in this country—as when an entire household is laid low with a similar train of symptoms through partaking of food cooked with rancid butter, and especially if cooked in a copper vessel the tinning of which is worn away or is otherwise defective.

But in the outbreaks now under consideration it is clear that the consequences of the feast in each case cannot be attributed solely to the possible causes above indicated, since in each instance the outbreak was attended by another parallel set of circumstances which were wholly unconnected with the feast, namely, the presence and activity of some general influence which produced the occurrence of other and usually isolated and widely spread cases of a similar nature, both at the same time and in the same locality.

Thus in the Delhi district in 1871 not only was cholera present in the city of Delhi for some weeks prior to the outbreak of the disease there towards the end of November, but isolated cases and deaths from cholera had been recorded in several parts of the district, as well as in the city, during the preceding months back to March. Similarly in the Peshawur district in 1880 not only was cholera present in the city for some weeks prior to the outbreak there in October, but isolated deaths had been recorded from that cause in several parts of the district during the months back to April, besides a local outbreak of the disease at Tangi in August; whilst the disease had already broken out among the troops in the adjoining cantonment a full month before it attacked the Bukhariots.

Taking these facts as they stand, it appears that both the Delhi tanner outbreak in 1871 and the Peshawur Bukhariot outbreak in 1880, the season in each year being non-epidemic, owed their severity to some special cause operating to aggravate the action of some general influence, whatever its nature, present in the locality, and which influence only manifested its activity in the persons of such individuals as it found prone to, or in a condition of body suitable to, its operation. On both occasions this proneness or suitable condition of the body in the individual, as evidenced by the occasional occurrence of cholera cases, was present both at Delhi and Peshawur, and at each place the action of the cholera influence was intensified and aggravated by some exceptional cause, which, apart from climatic conditions, was, in these two instances now under discussion, immediately connected with the food or the utensils employed in the feast immediately or shortly preceding the violent outbursts. The object in noticing these two outbreaks and comparing the circumstances attending their occurrence is to draw attention to the serious manner in which cholera influences, even in non-epidemic years, may be aggravated by accidents or indiscretions which predispose the individual to an attack of the malady. In the case of the Peshawur outbreak there can be no doubt that the sudden violence of the disease among the Bukhariots was largely due to the action of some cause, connected with the meal of the preceding evening, operating to aid that of the existing and active cholera influence; for the disease, though it did not attract attention in the city prior to this outbreak, had nevertheless been present there as early as the 18th August, and had appeared among the troops in the adjoining cantonment a full month before the Bukhariots were attacked.

The first appearance of cholera among the troops at Peshawur was on the 8th September, when 5 cases occurred in Her Majesty's 9th Foot on the night of the 8th and 9th, and was attended with a heavy fall of rain on the morning of the 9th September. This was the first fall of rain here since the preceding July.

Peshawur.—The monthly rainfall and cholera mortality in this district in 1879 and 1880 were as follows:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1879.	Rainfall	0·00	0·46	2·73	0·24	0·14	0·05	0·47	0·97	0·16	0·00	0·10	0·52	5·84
	Cholera	...	...	...	...	383	216	261	51	56	32	3	...	1,002
1880.	Rainfall	0·00	0·37	0·00	0·11	0·52	0·47	1·65	0·00	1·39	0·00	0·00	0·50	5·01
	Cholera	...	...	...	1	...	1	1	30	7	76	51	...	167

Mark here the cholera of 1880 breaking out in August during drought after rain in July, abating during the rain of September, and again breaking out with increased activity during the drought in October and November.

Rawal Pindi.—Altogether only 5 places in this district recorded cholera, and between them they registered a total of 31 deaths, of which 16 were returned by Hasanabdal and 8 by Rawal Pindi. The first cholera death registered occurred on the 2d March at Gujarkhan, on the Grand Trunk Road to Peshawur; the victim was a Hindu, aged 25, a traveller passing through the place, and was taken ill the preceding day; he was seen by the hospital assistant in charge of the dispensary here, who certified the symptoms of genuine cholera. The next death reported was on the 20th May, when a Muhammadan, aged 45, died at his own home in the village of Pharwal, situated a little way off the Grand Trunk Road, and about 4 miles to the north-west of Gujarkhan; he was taken ill on the previous day. A few days after his death a woman living in the same house was also attacked with cholera; she recovered. The third death was reported on the 14th June, when a Muhammadan lad, aged 15, died of cholera in the village of Lahore, 5 or 6 miles off the Grand Trunk Road, and 14 miles due east of Gujarkhan; he had returned home from a visit to Gujarkhan, was taken ill the same night, and died on the second day. The next death reported was on the 22d August, when a Muhammadan, aged 18, died of cholera after two days' illness, at his own home in a village 12 miles south-west of Gujarkhan. The next occurred at Gondal, on the Trunk Road, about 8 miles from Attock, on the 15th September, the victim a Hindu, aged 35, a resident of the place, who died after one day's illness. This was followed by a succession of cases at Hasanabdal, on the Grand Trunk Road; they were almost wholly confined to the camp-followers with the troops (affected with cholera) marching down the road from Peshawur. The camp-ground here is situated on the bank of a rivulet; the site lies low, and is damp and ill-ventilated. The first death here occurred on the 19th September, and was followed by several seizures, of which four terminated fatally in the intervening days up to the 27th September. All these deaths were among male camp-followers with the troops, except one which was in a woman, aged 20, a resident of the place. The next death here occurred on the 2d October, in a police constable who was taken ill nine days previously; then no other till 10th October, when 6 men died of cholera, all camp-followers, and within twenty-four hours of seizure. The next and last cholera death here was reported on the 17th October, when a man, aged 40, a resident of the place, died within

twenty-four hours of seizure. Altogether from 19th September to 17th October 13 deaths were registered here, and all except 3 among camp-followers passing through. On the 12th October 3 deaths were reported at the little village of Gadhwal, about 2 miles to the eastward of Hasanabdal—all 3 within twenty-four hours of seizure, 2 in strangers and the third in a resident, a boy aged 10 years.

Simultaneously with these cases at Hasanabdal cholera appeared at Rawal Pindi, where the first case occurred on 11th October. The victim was a Hindu, aged 21, a stranger from Haripur, in Hazara district; he died in the city dispensary after three days' illness. The road from Haripur to Rawal Pindi passes through Hasanabdal. No other cholera death was reported here till the 25th October, on which date 2 deaths, and again on the following day 2 deaths occurred; all 4 were strangers, and all died within twenty-four hours of seizure. On the 31st October the first death among the residents of Rawal Pindi was reported; he died on that date in the city dispensary after two days' illness. The next cholera death here was reported on 7th November; it occurred on that date in the city dispensary, the sufferer being a stranger; duration of illness seven days. The next and last cholera death reported here occurred on the 14th November, in a resident of the city, a Muhammadan male, aged 30, who died after two days' illness. Besides the above, a European guard of the Punjab Northern State Railway construction was attacked with cholera at Tarnaul, about 6 miles west of Rawal Pindi, on the 9th October, and died the same day in the Royal Artillery Hospital at Rawal Pindi.

Jhelum.—A total of 7 cholera deaths was registered in this district, the first on 13th June, the last on 15th October; all were isolated cases in as many different places, all on the line of the Grand Trunk Road or its vicinity.

Bannu.—Only 3 cholera deaths were registered in this district, all in the town of Isakhel, in October.

Hazara.—Altogether 5 cholera deaths were registered in this district, the first on the 16th July, the last 2 on the 27th September; the other 2 occurred on 21st September, both being in mule-drivers on the march with the 6th Punjab Infantry; 1 died at Haripur, the other at Abbottabad.

Gujrat.—In this district altogether 7 cholera deaths were registered; the first on the 5th May at Kanja, in a boy, aged 7, a resident of the town, who died on the same day that he was taken ill. The next 3 occurred at Kharián on the 14th, 19th, and 20th October respectively; all 3 were camp-followers with British troops on the march down country from Peshawur, and all died the same day as attacked, 2 in the sarae and 1 on the camp-ground. Of the 3 remaining cases, 1 was on 20th October at Lala Musa camp-stage, in a resident of the place, aged 35, who died the same day as attacked; the 2 others occurred in Lala Musa town, 1 on the 18th, the other on the 24th October; in both cases the victims were troopers of the 14th Bengal Cavalry who were on furlough, and each died on the third day of illness.

Lahore.—Altogether 14 cholera deaths were registered in this district, the first on the 31st March, the last on the 16th December. Taken in order of occurrence, the first was at the village of Khudian, in a resident, a man, aged 55, who died six hours after being attacked. The next 2 occurred in the city of Lahore, 1 on the 4th, the other on the 19th April; the former in a Muhammadan, aged 45, who died eight days after being taken ill; the latter in a Hindu female, aged 70, who died within twenty-four hours of seizure, each in a different part of the city. Besides these a third death from cholera occurred in April at Lahore, on the 14th, among the European

residents. The next and last death reported in April was on the 21st at Kasur, in a resident, a Muhammadan female, aged 20, who died three days after being taken ill. In May another cholera death was registered in the Lahore city; it occurred in a different quarter from those previously registered, in a Hindu woman, aged 40, a resident, who was ill one day. In June 2 deaths were registered; 1 on the 18th, in a village of the Mangtanwala circle, where a Muhammadan woman, aged 30, died "almost immediately after she was attacked;" the other on the 20th, in a village of the Raewind circle, where a Hindu male, aged 60, a resident, died also "immediately after he was attacked." In July 1 cholera death was reported; it occurred on the 9th, in a village of the Khabra circle, where a Hindu female, aged 20, a resident, died within twenty-four hours of being taken ill. The next cholera death reported was in October, in a European, at Lahore, on the 4th; and 5 others were reported during the same month in different parts of the district, viz., (1) on the 11th at a village in the Shahdra circle about 4 miles west of Lahore, an unknown Muhammadan male, aged about 50, found on the roadside; (2) on the 18th in the village of Sodarpur, in Kasur circle, a Hindu male, aged 48; (3) on the 20th, in the same village, a Hindu male, aged 50; (4) on the 21st, again in the same village, a Muhammadan male, aged 60;—none of these three men were residents; they had come to Sodarpur on business of their own from different neighbouring places, and all three died within twenty-four hours of being taken ill;—(5) on the 20th again, at the village of Phalla, in the Kasur circle, a Muhammadan lad, aged 13, a resident, died on the same day as taken ill. After these the next and last cholera death registered in this district occurred on the 16th December in the village of Sandu, in the Lahore suburbs; the sufferer, a Muhammadan boy, aged 6, died on the fourth day of illness.

The cases above mentioned as having occurred among the European community at Lahore were the following, viz., on the 14th April a little girl, aged 3½ years, and on the 4th October a railway employé, aged 36 years. Regarding the history of the last case, it is recorded, among other particulars, that he died in the Mayo Hospital from cholera on the date above given; and the following facts about him were ascertained by Dr. T. E. B. Brown, the Principal:—

"Mr. —— was a Welshman, and four months ago he acted as stationmaster at Jhelum, on the Punjab Northern State Railway, but was then discharged for drunkenness, and came to Lahore, where he became assistant stationmaster to the Sind, Punjab, and Delhi Railway, and lived in Mahalla Sultan's Sarae, near the Landa bazar; but a month ago he moved to Mr. ——'s house, between the railway station and the Mayo Hospital. There, they say, he drank spirits very much till the evening of October 2d, when he had no money. On that day he took the greater part of a bottle of Eno's fruit salts, and the next morning, October 3d, he drank a bottle of Harvey's sauce. Nevertheless he was well during the day, and ate a hearty dinner, but at night he was attacked with violent diarrhœa and vomiting, and at last fainted. He was taken to the Mayo Hospital on 4th October at 5 A.M. Dr. Brown saw him at 8 A.M. in a collapsed state, able to talk, with violent cramps, suppression of urine. He died at 1 P.M. The next morning a *post-mortem* was held; the intestines appeared like those of cholera. The contents of the stomach were sent to the chemical examiner, but no irritant poison was found."

In concluding my history of the cholera of 1880 in the Punjab, from which the foregoing account is taken, I wrote—

"Now, from the account given in the preceding pages, the following facts in connection with cholera in the Punjab during 1880 appear to be clearly established:—

"First, that the influence which produces cholera, as evidenced by the occurrence of isolated deaths reported under that head from different quarters, was present in the

eastern districts of the province during the whole year in a sporadic form, and that it manifested its presence in the north-western districts in a more active form only from April to November inclusive, during which period it caused some sharp local outbreaks.

"Second, that the occurrence of these local outbreaks at Tangi, Peshawur, Hasan-abdal, and Rawal Pindi was coincident with the influx into these places of large bodies of strangers, who were subject to the exposures and fatigues inseparable from the march and camp life at that trying season of the year; in the case of Tangi, the strangers being merchants, labourers, and beggars from the adjoining famine-stricken districts beyond that portion of the frontier; whilst in the case of the other places they were British troops—European and Native—and their camp-followers returning to India from field-service in Afghanistan.

"Third, that in each case the outbreak was of a strictly local nature, and nowhere spread among the general population around, as is evidenced by the fact that, with few exceptions, the entire mortality reported from cholera in the region lying between Gujrat and Peshawur, during the period subsequent to the outbreak at the latter place, occurred amongst the strangers travelling thence along the trunk road towards India.

"Fourth, that whilst the disease did not spread amongst the resident population along the route of the travellers, neither did it follow even those affected by it in the Peshawur valley further eastward than Gujrat. In other words, that the crowd of human beings who were subjected to the influences of cholera at Peshawur, and were there affected by the disease, carried it with them as far eastward as Gujrat, and no further.

"From the facts thus recorded the following inferences may be drawn, viz., that the influence, whatever may be its nature, which produces cholera, finds a favourable field for activity amongst crowded assemblages of human beings, especially when subjected to causes which tend to impair the sound health of the individual, as, in the instances under consideration, by exposure to the fatigues and privations of the march; but that the disease is dependent for the manifestation of its activity upon the presence of some other unascertained circumstances connected with the condition of the atmosphere, and probably of the soil also, of the locality in which it breaks out. That is to say, these unascertained conditions of the air and soil act as exciting causes, whilst the other ascertained conditions act as the direct predisposing causes of the disease. In other words, that without the presence of the exciting causes the predisposing causes are incapable of producing the disease.

"But whether these deductions be correct or not, the lesson we learn from the facts recorded in connection with the behaviour of cholera in the Punjab during the non-epidemic year of 1880 is the same—on a small scale, and therefore more easily comprehended—as that we have been taught by all previous visitations of the disease, namely, its assaults are to be staved off quite as much, if not more, by precautions on the part of the individual as by general measures of sanitation directed towards the improvement of the air, soil, and water about the sites of human habitations; for there is abundant testimony furnished by every visitation of the disease to prove that, however perfectly and assiduously general measures of sanitary precaution are carried out, they fail to counteract or avert the action of the epidemic influence in the air.

"Contrast, for example, the sanitary condition of our European barracks, with their costly and elaborately planned details for the preservation of health, against that of the ordinary dwellings of the general population of the country, with their mean, ill-ventilated, and overcrowded hovels, beset with filthy surroundings and an absolute neglect of even ordinary sanitation. Yet when cholera comes it punishes both alike with impartial severity—nay, if anything, the well-kept barrack more severely than the neglected hovel. To avert cholera, therefore, we should not content ourselves by reliance solely on attention to the measures required for maintaining our centres of habitation and our dwellings in the most perfect sanitary condition attainable—measures which on their own merits should at all times, and more particularly in seasons of epidemic sickness, receive most careful and constant attention—but we must also personally and individually aid the good effect of these measures by the exercise of judgment and discretion; by, at least, fair treatment of our own bodies and persons, and not, as is too often the case, thwart and counteract them by direct acts of indiscretion, by injudicious and careless conduct.

"I have given above, in the case of a death from cholera at Lahore, an instance—an extreme instance, but none the less of no uncommon occurrence—of indiscretion and unfair treatment of the body inducing an attack of cholera at a time that the disease was abroad in the locality in a sporadic form; and I have no doubt that many parallel instances would be discovered on investigation amongst the fatal cases of cholera which occurred amongst the troops and their followers on the occasion of their being affected by the disease at Peshawur and along the line of their march thence. The outbreak amongst the Bukhariots in Peshawur city is another instance of the disease being

induced, whilst its influence was present in the place, by a predisposing cause connected with the food of the sufferers. The necessity, therefore, for vigilance on the part of the individual in all that pertains to the maintenance of his bodily and vital powers in a state of health and strength is apparent; and this individual vigilance is more especially necessary in respect to eating and drinking, as much as to careless exposure to the weather, but, above all, in respect to excessive fatigue or exhausting exercise."

It has been stated in a previous passage that the rainfall of this year, in its seasonal distribution, corresponded very closely with that of the preceding year. This was the case so far as the quarterly distribution of the rainfall is concerned, but the monthly rainfall varied considerably in the two years. In the subjoined statement are shown, for the purpose of comparison, the monthly average rainfall of the province and its total monthly cholera mortality for the years 1879 and 1880:—

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
1879.	Rainfall .	0·05	0·24	2·16	0·06	0·18	4·38	5·16	8·68	1·82	0·05	0·00	0·78	23·56
	Cholera .	7	4	2	2,603	9,184	7,085	3,457	2,705	914	147	7	20	26,135
1880.	Rainfall .	0·37	1·65	0·01	0·09	0·70	3·63	10·28	2·54	2·25	0·00	0·14	0·87	22·53
	Cholera .	1	3	6	9	7	15	8	33	14	120	55	3	274

The difference to note is the want of rainfall in March 1880 for the drought and increasing heat of April to act upon for the production of evaporation from the surface of the soil; and again the activity of cholera in October during the drought following the rainfall of the preceding three months, which was 2⅛ inches less than the average fall for that period; though by the unusually heavy fall in July, it sufficed to saturate the soil suddenly, and this state was more or less maintained by the falls in the next two months.

The food-supply of 1880 varied greatly in different parts of the province, and though prices were cheaper than in 1879 in most parts of the province, they ruled at famine rates in the Peshawur and Rawal Pindi districts.

1881.—In this year, the first of the triennial cycle 1881–83, the periodical cholera epidemic made its appearance in due course, and commenced its cyclic career with a revived epidemic activity. This is the last year of the series of twenty with which this history deals; consequently the statistics for the two succeeding years of the cycle have not been compiled and tabulated. There are no figures, therefore, to illustrate the course of the cyclic cholera epidemic through the three successive years corresponding to those for the preceding cycles. But general observation leads to the belief that the cholera epidemic of this cycle pursued the normal course of maximum intensity in the first year, abatement in the second, and subsidence in the third, not only in this province but throughout India generally. In 1880 the cholera death-rate among the troops and jails was 3.24 per mille of strength, and among the civil population 0.30 per mille. This increased activity of the disease was coincident with a slight improvement in the prices of food and with a considerable increase in the rainfall.

The incidence of cholera in 1881 among the troops and jails is shown in the abstract in the tabular statements Nos. III. and IV. at the head of this section.

The cholera mortality registered among the civil population is shown by districts in Table No. I. and by months in Table No. II. The epidemic activity of the disease was most marked in the northern districts of the province which lie between the Rivers Sutlej and Jhelum, but was manifested also in the south-eastern districts bordering on the River Jumna, and also in extreme north-western districts lying between the Rivers Jhelum and Indus, though here in a lesser degree of severity. The southern and western districts of the province, with some important exceptions in the extreme north of the trans-Indus tract, remained generally exempt from cholera throughout the year.

The epidemic cholera of 1881 commenced activity in May and slowly increased till July, in August it bounded forward with great force, culminated in September, and suddenly subsided in October, but lingered on to the close of November. The average monthly rainfall and total monthly cholera mortality for the province are shown in the subjoined statement:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1881	Rainfall .	0·12	1·21	2·48	1·54	0·73	3·16	8·52	7·09	1.40	0·14	0·00	0·08	26·47
	Cholera .	3	4	4	5	37	178	183	1,649	2,560	545	38	1	5,207

Mark here how the epidemic begins activity in May with the drying up of the rainfall in April, advances with the light fall in June, remains stationary with the heavy fall in July, bursts out in force with the commencing drying up in August, and increases greatly with the continuance of the drying up in September, and subsides suddenly with the fall of temperature and trivial rainfall in October.

The cholera of 1881, after local outbreaks of activity in the beginning of May at the foot of the hills between the Umballa and Simla districts, and again towards the end of that month in the Delhi district, broke out in epidemic form early in June in the country at the foot of the Himalayas between the Rivers Sutlej and Ravi, and, as already stated, was mainly confined, as an epidemic of general diffusion, to the northern districts of the province. Altogether only 372 places recorded cholera in 1881 out of a total of 34,973 in the province. Of the 32 districts in the province (see Table No. I.) 8 recorded no cholera mortality whatever; in 8 others the returns indicate a mere presence of the disease; of the remaining 16 the 3 following felt the epidemic influence of the disease more severely, viz., Lahore, Amritsar, and Jullundur; in 7 other of these districts the disease was less severe, and in the remaining 6 it was mild.

The first appearance of cholera in an epidemic form was observed in the village of Khundin, in the Pinjor circle of the Patiala State, and the outbreak was apparently entirely confined to that village. The following are the particulars recorded:—The outbreak occurred on the 2d May, and up to the 7th May 10 deaths had occurred. The people deserted the village and fled into the jungle in different directions; on the arrival of medical aid a few were induced to return to the village, and a young child and a boy of 10 years of age, who were taken ill of the disease in the jungle, were brought in for treatment by their relatives. "The child recovered, but the boy died, upon which those who had come in again deserted the village; and up to the 9th May, when the Native doctor left, not one of them had returned, nor had any information been received regarding them." It is stated that altogether about 13 deaths had occurred up to the 9th May, and that the two first attacked were both men who "had just returned from Hardwar,

whither they had gone to perform the usual Hindu ceremonies." They died in from twelve to twenty-four hours after being taken ill. None of the neighbouring villages were affected. "The water-supply was obtained from shallow wells dug in the bed of a nullah about 50 yards distant from the village, which at this season was nearly, if not quite, dry. The neighbourhood of the nullah is said to have been clean, but the village itself was exceedingly dirty, filth of all kinds lying in heaps in front of every door, the stench from which was most offensive." Dr. Skene, from whose report these details are derived, adds—"The localisation and the sudden cessation of the outbreak was probably in a great measure due to the custom which prevails among these hill villagers of deserting their homes and camping out in the jungle whenever either cholera or smallpox makes its appearance among them, their admission to other villages being strictly guarded against." This outbreak occurred in the independent state of Patiala, which is not under registration, and no further details of the progress of the disease in the territory of that state are available. It is known, however, that the disease appeared later on in several parts of the state, but the capital and its vicinity escaped, and it does not appear that the disease prevailed with special severity in any locality within its limits.

The next place in which cholera appeared in epidemic form was in the Delhi district. The following are the particulars recorded regarding this outbreak:—"The first known and authenticated case of cholera" in the Delhi district occurred on the 26th April, in the person of a servant of one of the officers of the garrison in the fort of Delhi. The man had been to a fair held near the Juma Masjid on the preceding night, and was taken ill with cholera the next morning, 26th; he died that day. No other case of cholera was reported till the 6th May, when the disease appeared at the village of Karor, population 1259, near Sônpat, on the Grand Trunk Road. Here 8 cases occurred, of which 6 were fatal, up to the 15th May, when the disease ceased. On the 8th May 3 cases, all fatal, occurred in the Mughalpura quarter of the Sabzi Mandi suburb of Delhi city; 2 were Muhammadans, the other was a Hindu grain-dealer. On the 16th May an outbreak occurred at the village of Bazidpur, population 978, about 15 miles from Delhi, on the Western Jumna Canal, and the following circumstances are recorded in connection with it:—

"A marriage feast had been given among the tanners of the village on the preceding day, the 15th May, and it was attended by about twenty of their caste-fellows, tanners from the Mughalpura quarter of the Sabzi Mandi suburb of Delhi. These tanners had gone to Bazidpur to the marriage on the 15th, had partaken of the feast on that evening, had all bathed in the canal the morning of the 16th, when cholera seized three of them, who were put into a cart and carried home; they all died, as also a fourth, taken ill on the way. The returning party was stopped outside Delhi and the dead disposed of, but some members of it got into Mughalpura, and two more of them were taken ill there after their return."

On the 18th the principal outbreak took place; 11 cases, including the 2 above mentioned, were detected by the civil surgeon himself in Mughalpura; from the 19th May to 7th June 32 cases occurred, of which 13 died. The cases were almost all seen by the civil surgeon himself, who reported—

"They were undoubtedly cholera; most of those which were detected early and treated recovered; two-thirds recovered of those treated, though some were in the last stage. The cholera does not seem of an unusually severe type, and although the percentage of deaths among the cases not under treatment is high—15 of 17—it must be

remembered that probably almost the only cases that were heard of were the fatal ones, which could not be concealed. It is a remarkable fact that, though cases have occurred here and there in other parts of Delhi, the disease has shown no tendency to spread or to stick to the localities in which it cropped up."

On the 19th May a fakir died in his hut outside the Turkman gate of the city; "he had gone to Mughalpura the day before the day of the principal outbreak there, and ate food there." On the 21st May another fakir, who lived in the same hut with the preceding case, was taken ill and died on the following day. On the 27th May a servant of an officer in the fort died near the Kashmiri gate, and on the 2d June a boy belonging to the Mission School died in Sherkhana. Prior to this last case a chaukidar belonging to the Teliwara suburb died on the 29th May, after having gone to a feast the night before in the Sadr bazar. On the 3d June a boy forming one of a marriage procession from the village of Kankar Khera was taken ill; he was seen by the civil surgeon, and recovered. On the 5th June a merchant from Bikanir, who arrived in the Sadr bazar on the 2d, was taken ill with cholera, and died in the hospital on the 7th. These were the only cases in Delhi which came to the knowledge of the civil surgeon, but a few others appear in the mortuary returns; altogether 10 deaths were registered in the city and 68 in the suburbs, and 89 in the district from 11 villages; of these, Bazidpur, population 978, returned 20 deaths, the first on 16th, the last on 30th June; Fatopur, population 300, in Alipur circle, 30, the first on 6th, the last on 13th July; Isapur, population 1021, in Najafgarh circle, 12, the first on 13th, the last on 18th June; and Jia Aulia, population 680, in Sônpat circle, 6, the first on 10th, the last on 14th June. In both these last-named villages the disease began, and in the case of the last ended, before the outbreak commenced in Bazidpur. In Fazilpur, population 439, in Rai circle, cholera did not appear till 14th September; it caused 5 deaths here, and ceased on 21st September.

The monthly rainfall and cholera mortality in the Delhi district in 1881 were as follows:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1881.	Rainfall	0·00	0·59	2·01	0·30	0·14	1·71	11·59	9·21	0·75	0·00	0·00	0·00	26·30
	Cholera	...	...	...	...	29	86	47	...	5	...	...	...	167

Lahore.—Total cholera deaths registered 1643, in altogether 116 places; of these latter 50 had only single deaths, 22 only 2 each, 11 had 3 each, 4 had 4 each, and 2 had 5 each; in 14 places the number of deaths ranged between 6 and 10, in 7 between 11 and 20, and in 6 it exceeded 20. These last 6 places were—Lahore city, population 92,035, deaths 772; Anarkali suburbs, population 36,406, deaths 329; Kasur, population 16,793, deaths 98; Khem Karn, population 5860, deaths 34; and Mahamdipur, population 463, deaths 25. The cholera of 1881 was more widely diffused and more severely prevalent in this district than in any other part of the province. The earliest cholera death here was on the 6th March, in Lahore city; on the 15th another death was registered in the Targarh village, population 100, in Shahdra circle, adjoining the city suburbs, and it was the only case recorded here throughout the year. The next record of cholera here was in May, when 2 deaths occurred on the 10th, 1 in Chunian, population 6469, the other in Burj Kalan, population 1354, in Kasur circle; this last was the only cholera recorded in Burj Kalan throughout the year, but in Chunian 8 others were registered during September and October.

In June cholera began epidemic activity here; 51 deaths were registered in the month, and most of them occurred in Lahore city and neighbouring villages. In July the epidemic increased, and 104 deaths were registered, mostly in Lahore city and the suburbs; but the disease appeared also in 13 new places not previously affected, of which 5 returned only single deaths and 2 only 2 each throughout the year. In August the epidemic attained its climax with 818 deaths registered; of these 499 occurred in Lahore city and 195 in its suburbs; in this month 27 new places recorded cholera, but 15 of them returned only single deaths, 4 only 2, and 2 only 4 each throughout the year. In September the epidemic began to decline in the large towns previously affected, but was still active in the district; of 590 deaths registered in this month 237 were in Lahore city and 75 in its suburbs (Anarkali), and 52 places were newly affected, of which 23 returned only single deaths, 11 only 2, 7 only 3, and 2 only 4 each throughout the year; in the other 9 places the deaths ranged between 5 and 18. In October the subsidence of the epidemic was general everywhere in the district; altogether 71 deaths were registered in this month; of these Lahore city returned only 3 and its Anarkali suburbs 4, the rest in the district, where 11 places were now for the first time affected; of these last, 7 had only single deaths, 1 only 2, and 1 only 3 throughout the year. In November the epidemic completely subsided in this district; only 5 deaths were registered, viz., 3 in Anarkali suburbs of Lahore, and 2 in the village of Virhi, population 254, in Chunian circle, which was now for the first time affected, and both deaths occurred on 1st November. The first cholera death registered in this district in 1881 was on the 6th March in Lahore city, the last on 5th November in its Anarkali suburbs; and altogether 1643 deaths were registered in the district.

The evidence afforded by this distribution and incidence of the disease leads to the conclusion that, whilst certain centres of populous habitation became the seats of cholera activity, a very large proportion of the rural centres of population, which are very much less populous, afforded no field for the activity of the disease, notwithstanding its manifested presence in them by the occurrence of one or more cases of cholera. The explanation of this circumstance is probably to be found in the generally superior conditions of life in respect to food, clothing, and shelter enjoyed by the agricultural classes, in comparison with those same conditions as they affect the poor and labouring classes—the chief victims of cholera—in the large cities and populous towns; the presence of the cholera influence, in greater or less force, being of course always understood, for in its absence, as all experience teaches, epidemic cholera cannot prevail.

That the cholera influence was present at Lahore during the epidemic of 1881, so far as that influence owes its origin to the nature of the rainfall, will be seen by a glance at the subjoined statement, which shows the monthly rainfall at Lahore and the cholera mortality registered in the whole district during 1881:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1881.	Rainfall .	0·03	1·31	2·35	0·57	0·95	0·44	12·38	8·05	0·18	0·12	0·00	0·00	26·38
	Cholera .	...	...	2	...	2	51	104	818	590	71	5	...	1,643

Here we find epidemic cholera beginning in June with the drying up of the rainfall of the preceding months, advancing slowly under the heavy falls in July, increasing rapidly with the diminished fall in August, still active with the drying up in September, notwithstanding the decline in temperature, and finally

subsiding in October with the termination of the hot weather and no rainfall to supply material for evaporation. It is to be borne in mind besides that the two preceding years were seasons of progressively increasing drought, the total rainfall at Lahore for 1879 being only 19.18 inches, and for 1880 only 11.27 inches, and that, therefore, the heavier rainfall of 1881, in the third quarter especially, fell upon a more or less thirsty soil; and this explains the activity of the cholera under the comparatively heavy rainfalls of July and August 1881.

Regarding the circumstances attending the earlier cases of the epidemic in Lahore and its vicinity, the following details are derived from the report of the civil surgeon :—The first case was that of a Hindu, aged 65, who lived in the city near the Fort, and was said to have been taken ill with vomiting and purging on 31st May, and to have died the next day. On the 5th June the disease appeared at Mian Mir, where two European soldiers and two Natives were seized in the cantonment. On the 6th June two young men, hearing of the seizure of a friend on the previous day at Mian Mir, went from Lahore city to see him, and both were taken ill with cholera on their return the same night; one of them recovered, the other died. The next case in the city was that of the wife of one of the two Natives who had been seized with cholera at Mian Mir on the 5th and died on the 6th June, and whom the two young men from Lahore went to see; on hearing of her husband's death she went to Mian Mir to bring his body back for cremation, was herself seized on the 7th, and died on the 8th. At Mian Mir cholera "smouldered there for some days after its first appearance, but then burst out with virulence on the 12th and 13th June." Excluding cases here, the fifth case reported in this district was that of the wife of a Hindu shopkeeper there, who went from Mian Mir to Nawakot, a village near Lahore, on the 8th June, was seized there on the same day, and died on the next. The sixth case was that of a Hindu fakir at Mian Mir, where he was seized on 9th June; next day he was brought to Lahore labouring under the disease, and died in the city. The seventh case was that of a servant in a coppersmith's shop at Mian Mir; he was seized there on the 9th June, was brought to his house in Lahore city on the 10th, and died the same day. The eighth case was that of a man, aged 25, employed in a shop in Anarkali bazar, between which and shopkeepers in Mian Mir there was much communication; in fact, he had himself lately gone to Mian Mir on business.

On the 10th and 12th June 6 cases occurred in Lahore and its suburbs. On the 13th the disease burst out with virulence among the beef butchers occupying a confined dirty part of the suburbs near Anarkali bazar; twenty-four of these were seized from the 13th to 21st inclusive. The locality was evacuated and the disease stopped. During this period also 14 or 15 other cases "of a dropping nature" occurred in different parts of the city and suburbs. It is noted that this is the severest epidemic of cholera that has visited Lahore since 1856, and the cause of its severity might have been attributed to the very insanitary state of the city, which has already been alluded to, were it not that the disease proved equally virulent at Mian Mir, where no such insanitary conditions prevailed; though, the cantonment being situated on a wide, open, flat plain, the effects of rainfall on the soil after drought would have unusually free and uninterrupted play, and this, I think, is a point worth consideration in explanation of the severity of the epidemic among the troops there.

With the exception of the outbreak among the beef butchers, cholera did not burst out in local explosions anywhere else, but was pretty equally dis-

tributed all over the town and its suburbs, attacking Europeans as well as Natives. The railway employés suffered severely, and the disease lurked in the Lunatic Asylum (in the railway quarter of the station) from July to September, every now and then carrying off one of its inmates. Cholera stuck so persistently to the Fort, notwithstanding the frequent changes in the European detachment there, that at last it had to be evacuated by the European troops altogether for a time. The cantonment at Mian Mir retained the disease till late in November, and every attempt to bring back the European troops from their encampment was followed by a fresh outbreak. The Central Jail at Lahore suffered a severe outbreak; altogether there were 125 cases and 90 deaths between the 7th and 30th August. The epidemic ceased suddenly on the 30th August after a heavy storm of wind and rain, the wind, which had previously been in the east, going round to the west. In his report on this outbreak the superintendent of the jail, Dr. Dickson, writes—"There is one remarkable feature about the epidemic, that the Central Jail prisoners were alone affected (with the sole exception of the juveniles, who occupied a separate ward). How the establishment escaped I cannot say, for I had the greatest difficulty in preventing the jamadars of the wards from sleeping among the prisoners."

With regard to the cholera of 1881 in this province, it was observed that in Lahore, as also in Amritsar and some other towns epidemically affected by the disease, the epidemic cholera was accompanied and followed by an epidemic intermittent fever which manifested in many cases the symptoms held to be characteristic of cholera, and this was so generally the case that some difficulty was experienced in distinguishing the cases of intermittent fever from those of cholera. In the subjoined tabular statement are shown the deaths registered in each month from fever and from cholera during the epidemic year 1879, in comparison with those registered from the same causes in the year 1881, in the city and suburbs of Lahore respectively:—

Months.	Lahore City.				Lahore Suburbs.			
	1879.		1881.		1879.		1881.	
	Fever.	Cholera.	Fever.	Cholera.	Fever.	Cholera.	Fever.	Cholera.
January	400	...	172	...	118	...	53	...
February	294	...	130	...	48	...	41	...
March	250	...	140	1	64	...	39	...
April	222	8	119	...	42	2	29	...
May	298	13	151	...	59	12	30	...
June	226	5	204	12	48	8	37	19
July	220	23	179	20	37	4	39	33
August	215	10	686	499	41	6	85	195
September	235	3	456	237	38	2	94	75
October	288	2	586	3	55	...	112	4
November	257	...	508	...	54	...	93	3
December	219	...	283	...	54	...	79	...
Totals	3,124	64	3,614	772	658	34	731	329
Death-rates	33·94	0·69	39·27	8·39	18·07	0·93	20·08	9·04

The term "fever" comprises all sorts of fever, but by far the great majority are of a malarious or intermittent kind; therefore the figures in the above statement are not strictly correct as regards "intermittent fever," but they serve sufficiently well for the purpose of comparison with cholera when taken by their seasonal prevalence.

The figures show a very sudden rise in fever mortality in August 1881, coincidently with the maximum mortality from cholera in that month, both in the city and in the suburbs, and a continuation of the high fever mortality for two months after the cessation of cholera activity. This high fever mortality so early in the season is unusual in the Punjab, and in the instance now under consideration lends support to the opinion that the fever and cholera mortality have been confused in the returns for August and September, owing to the inability to distinguish the one disease from the other in a certain large proportion of cases. A somewhat similar confusion of the two diseases obtained during the course of the epidemic at Amritsar; but it is to be noted that the epidemic fever in the two cities compared—Lahore and Amritsar—prevailed under very different local conditions, and also with very different intensity, as well as at a somewhat different period of the season, as is shown on a subsequent page.

At Lahore the elements of a waterlogged soil in consequence of excessive local rainfall and obstructed drainage, as well as distress for food among a large section of the population, both of which were conspicuous features in the attendant circumstances of the fever and cholera epidemic at Amritsar, were altogether absent, comparatively speaking. At Lahore the high mortality from fever and cholera took place simultaneously during the months of August and September. At Amritsar, as will be seen further on, both the fever and cholera mortality were almost wholly confined to the city population, although the suburbs there suffered more than the city from the direct effects of the heavy rainfall and obstructed drainage, whilst it was later and more prolonged in its duration than at Lahore, not commencing till September and lasting till quite the end of November. In the instance of Amritsar, as compared with that of Lahore, we have a very lamentable illustration of the manner in which an epidemic influence may be aggravated and intensified by the accidental concomitance of unfavourable conditions of life. What effect these unfavourable conditions of life may have had in causing the acknowledged amalgamation of the two diseases is a subject of great importance, and one requiring very careful attention. At Lahore, although there was not any excessive rainfall nor waterlogging of the soil, as at Amritsar, nor yet the state of starvation which obtained among a very numerous section of the population of the latter city, still the sanitary condition of the city, bad as it has always been, was at the time of the outbreak of this epidemic sickness in an even worse state than usual, owing to accidental circumstances which happened to be coincident with the presence of the epidemic influence. For instance, the sewerage of the city was greatly obstructed in some places by the works in progress in connection with the new water-supply of the city, whilst the bursting of the great reservoir, by flooding many of the streets in which the sewage drainage was thus obstructed, greatly intensified the evils already existent. The insanitary conditions of the soil, water, and air of the locality, brought about or intensified by the accidents above mentioned, undoubtedly exercised an injurious effect upon the health standard of the people just at the time that they had to face an epidemic influence abroad in the air of the locality, and they suffered in consequence more severely than they otherwise would have done, the incidence of the mortality,

as is always the case, falling most heavily on the poorer classes, who are the most exposed to these insanitary conditions, and the least able to obtain suitable remedial treatment.

In other words, the drift of the foregoing remarks is this, namely, that it is the condition of the individual in point of bodily health and vigour which determines his freedom from or subjection to any epidemic influence that may be abroad. The truth of this assertion is most clearly established by the experience of every year's sickness in this province, and in this year, 1881, is very strangely emphasised by the experience of the city of Amritsar, no less than by the fact that, as regards cholera, the disease with which we are now more immediately concerned, the mortality has been in the main confined to the larger centres of population in the areas visited by the epidemic influence, these centres of population being the places in which are assembled the largest numbers of the poor and unhealthy. It is to be borne in mind, however, that for them to suffer the epidemic influence must be present. That it is not uniformly diffused everywhere over a region or tract of country during the epidemic season is very clearly illustrated by the foregoing account of the distribution of the mortality caused thereby in this district of Lahore, the one district in this province in which the cholera of 1881 is shown to have been most generally diffused as an epidemic. In more than one-half of the 116 places recording cholera only one or two deaths were reported from this cause, and as in a large proportion of these deaths it is known that the sufferers were either travellers or else residents who had just arrived or returned from places where cholera was prevalent at the time of their departure thence, it is natural to conclude that they contracted the disease in those places where the epidemic was present, and that, although dying of it in other places in widely scattered parts of the district, they failed to spread it there because the epidemic influence was absent from all those places. On the other hand, where the epidemic influence happened to be present, whether populous towns or hamlets of only a few score families, such importation of the disease is always followed, if indeed it has not been already preceded by it, by fresh manifestations of cholera activity. Why the epidemic influence of cholera should be present in one place and not in all places within the area of an epidemically affected region is a question which awaits solution; this solution I shall attempt to make in a subsequent part of this work. But, at the same time, it is to be noted that the phenomenon of this partial distribution is not peculiar to cholera any more than it is to its congener, epidemic influenza, or even its allied malady, intermittent fever when epidemic, or even than it is peculiar to other diseases which have nothing, so far as we are aware, in common with cholera in respect to nature, symptoms, and pathological characteristics.

Umballa.—Altogether only 18 places in this district recorded cholera, and 10 of them returned only single deaths, whilst in 4 others the deaths did not exceed 5 each. Umballa city, population 26,258, registered 125 deaths, or considerably more than half the total cholera mortality registered in the whole district, the first on 1st July, the last on 29th September. The village of Siga, population 1367, registered 34, the first on 15th September, the last on 4th October; Kongpur, population 340, returned 19, the first on 23d August, the last on 13th September; Shahabad, population 11,660, had 12, the first on 12th September, the last on 20th October.

The first case of cholera observed in this district occurred on the night of the 30th June in Umballa city, in a poor woman residing in the Jât quarter, who died after eight hours' illness on the morning of the 1st July. "A few

hours before being taken ill she had eaten some under-cooked rice of very inferior kind, with some curds." The second case occurred in quite another part of the town, in a municipal messenger, "who had eaten a large water-melon on an empty stomach, and was then exposed to the sun, and got cholera about 11 A.M. on 2d July, and died on the 3d." The house in which this case occurred is described as "very dark, filthy, and unclean, about six persons living in a small room about 10 feet by 6, and 10 feet high." On the 4th July 2 fresh cases were reported in different wards of the city; they recovered. One of them was the wife of a medical student, who was afterwards employed on cholera duty; the other lived in a house in which a boy had died suddenly a few days before with diarrhœa. No fresh case was reported in the city between the 5th July and 13th August, when the disease broke out afresh, and soon cases occurred in all parts of the city, the period of greatest intensity being from 24th August to 14th September. In these twenty-two days there were 287 seizures and 106 deaths reported; no quarter of the city was exempt from the disease, and at the height of the epidemic the sweepers suffered severely, no less than 39 cases occurring in their quarter. But from the first case on 30th June to the last on 29th September 327 seizures and 125 deaths were reported in the city.

During the course of the epidemic in the city a case of cholera occurred in the police lines outside on the 22d August. "The man had been to the city, and probably contracted the disease there. No other case occurred in the police lines." This man died, and very strict precautions were taken to prevent other men of the police from going into the city. The civil surgeon adds—"Quarantine was enforced in the jail also, and it escaped. Free communication went on all through between the city and the cantonment bazars. Cantonment also escaped. The police lines are about a quarter of a mile, the jail one mile, and cantonments four or five miles from the city in the same line." The disease is described as presenting all the usual symptoms of cholera, viz., "rice-watery motions, generally accompanied by severe colic pains at the pit of the stomach, with great thirst, nausea, and vomiting, great restlessness, with cramps in legs and arms, coldness of the body, great depression of spirits, stoppage of urine, sinking of the eyes, &c." Some cases were seen "without any purging or vomiting, but complaining of great restlessness of the body, throwing about of the extremities, with intense thirst, great pain at the pit of the stomach, and ice-cold body, suppression of urine, and immediate death in an hour or two from the commencement." Some of the cases, it is stated, "had a marked preliminary stage for two or three hours," and "in all such cases the timely use of sulphur fumigation to the body and sulphuric acid drink checked the attack." The disease here appears to have been confined almost entirely to the city, and it was observed that a greater number of Muhammadans and other castes suffered than Hindus. Out of the 327 seizures 121 were Hindus, 151 Muhammadans, and 55 "other castes." The difference was attributed to the observance of the Muhammadan fast, which commenced on 28th July and ended 28th August, but the deaths registered in September just treble the number registered in August.

The weather is described as "excessively hot" in May and June. In June rain fell on the 9th and 11th, and not again till the night of the 28th. In July the weather was more or less constantly cloudy, and the temperature 8 or 10 degrees lower than in June. Rain fell on the 20th and 21st, and again on the 28th. In August the weather is described "as raining every second or third day, and keeping excessively hot in the interval. In August

it has rained for a short time in the day, and for the remaining part of the day the velocity of the air has been very low." About the time of the outbreak in the city on the 13th August "it commenced raining excessively, . . . and it remained so raining for many days of August." It was observed as a feature in the course of the epidemic that many cases occurred for three or four days, and then none at all, or very few, for a similar number of days. Similarly many cases occurred in one ward at one time, and then in another ward quite in another quarter, and after a few days again in the ward first affected.

The water-supply of the town is from wells and tanks outside the walls. Inside the city almost all the wells have run dry since several years past. The outside wells are in the fields around the town, and in them the water lies deep down and is very shallow, in none exceeding a depth of 1½ foot. Some of these wells are not provided with parapet walls, and are in consequence liable to pollution from surface drainage.

The monthly rainfall at Umballa and the cholera mortality of the district in 1881 are shown in the subjoined tabular form :—

1881.		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
	Rainfall .	0·20	0·40	1·80	0·50	1·10	3·10	9·70	7·30	1·90	0·00	0·00	0·00	26·00
	Cholera .	...	...	...	...	...	...	3	32	145	31	...	1	212

The point to be noticed here is the activity of cholera in September with the drying up of the previous rainfall.

Amritsar.—Altogether only 22 places in this district recorded cholera. Of these, 12 returned only single deaths, in 5 others the deaths did not exceed 3 each, and in the other 5 the deaths were distributed as follows :—Amritsar city, population 136,166, deaths 612, the first on 29th March, the last on 7th November; Koti Said Mahmúd, population 1136, deaths 29, the first on 4th and the last on 21st September; Majitha, population 6004, deaths 18, the first on 11th May, the last on 17th October; Bháwan, population 1482, deaths 7, the first on 4th and the last on 11th September; and the village of Thata, population 440, deaths 17, the first on 24th September, the last on 2d October. The disease was, in fact, confined for the most part to the city of Amritsar, in which more than six-sevenths of the entire registered mortality occurred—to the intra-mural city as distinguished from its suburbs, which latter, population 6215, returned only a single death from cholera, on the 8th October.

The outbreak of cholera in the city of Amritsar, and the course of the disease there during the general epidemic cholera of 1881, though bearing some points of resemblance to the epidemic of 1869, was attended with some exceptional circumstances, which require special notice.

The city of Amritsar is one of the most populous and wealthy in the Punjab. It is also pre-eminently the one Native city in which sanitary improvements have made the greatest advance, so far as this province is concerned. But it, at the same time, has the misfortune to be one of the very worst situated towns in the whole province in respect to physical conditions of its locality. The city is built in the depression of a wide plain, upon the line of its main drainage, which is naturally in this position very defective. The soil consists of an upper crust of light clay, which is about from 6 to 10 feet deep, and contains here and there thin beds of stiff compact clay, in which are imbedded small agglomerations of nodular limestone. Below the upper crust is an indefinitely deep stratum of coarse grit, and lower down a fine sand. This stratum contains the subsoil water. In the

dry weather the depth of this subsoil water below the surface ranges from about 8 to 18 feet. In the rainy season the subsoil water rises everywhere close to the surface, and in some localities issues on the surface. In the vicinity of the city the fall of the surface-drainage is about only a foot in a mile, and the area of the whole locality is traversed by numerous irrigation-cuts drawn from the Bari Doab Canal, which passes within 2 or 3 miles of the city. Some of these cuts are high-level channels, but it is not known that they materially obstruct the surface-drainage of the area. The natural defects of the position in regard to drainage, both surface and subsoil, produce a more or less complete waterlogging of the land during every season of heavy rainfall. This defective drainage is the great fault, from a sanitary point of view, of the locality in the midst of which the city of Amritsar stands.

As regards the sanitary condition of the city itself, it is now immeasurably superior to what it was twenty years ago. The municipality is the wealthiest of any in the province, and has liberally spent its income in the furtherance of all sorts of sanitary improvements, which have been steadily progressed from year to year, and are still in course of progress. The city is now, and has been for some years, furnished with a complete and comprehensive system of surface-sewerage by means of open street gutters, which discharge into an open outfall sewer, in which the sewage is conveyed away to a distance of 6 or 7 miles from the city. The merit claimed for this system of sewerage is that it prevents the possibility of the accumulation of sewage matters within the city walls, and removes the chance of the soil becoming saturated by such matters. The gutters and outfall sewer are daily swept and flushed with clean water, and are remarkably free from the foul stinks attaching to underground or closed drains and sewers. The conservancy establishment of the city is the best-organised and most efficiently worked of any in the Punjab, and the scavenging of the city more thorough than that of any other Native city in the province. The wells used for drinking purposes are carefully looked after, and from time to time are cleaned out. But there are within the intra-mural area of the city some large and deep tanks of a sacred character, which have not been once cleaned out within living memory, and which are in a very foul state. The streets are mostly paved or metalled, and in the main thoroughfares are wide and fairly ventilated. There are parts of the town in which the houses are overcrowded and where ventilation is defective, but in these respects the city of Amritsar is not worse off than most Native cities in this province.

A brief description of the sanitary features of the city has been given in the history of 1869, and it need only be here added that the usual sanitary condition of the city in 1881, at the time of the outbreak of cholera, towards the close of July or commencement of August, was in no respect worse, but in many respects better, than in the earlier year mentioned. The main points of difference between the attendant circumstances of the epidemic outbreak of sickness in the two years compared relate more to the effects of the weather and those of the life-conditions of the inhabitants during the later year, than to the mere sanitary state of the city itself, to which, as we have seen, the mortality in 1881 was almost wholly confined. In 1881 there was an exceptionally heavy rainfall, strictly local in its excessive quantity, and a very large class of the inhabitants of the city were suffering, if not actual starvation, very severe distress for food.

Dr. Ross, the civil surgeon, reporting on the epidemic of 1881, writes—"The heavy rainfall which commenced in June caused immense collections of water over a tract of canal-irrigated ground to the north and north-east of

the city of Amritsar. Two natural drainage channels, the Gumtala Nullah and the city ditch, being quite inadequate to carry off the water, the consequence was that the spring level rose to an unprecedented height, water even bubbling up like miniature geysers. All the wells became thoroughly polluted, and the water in them tasted distinctly brackish. Fever in the city did not appear in an epidemic form till September; it was preceded by cholera, which showed about the beginning of August. . . .

"This cholera was of an extremely fatal type, and later on, when masked by fever, there was some difficulty in recognising it in time. The fever, which prevailed with its utmost force in September and the early part of October, appeared to be of the relapsing fever species, but with some affinity to cholera. There were the rigors, fearfully severe headache, insomnia, disordered bowels (often constipated), suppression of urine, and death by coma, frequently within a few hours after seizure of relapsing fever; but then the rice-water evacuations and vomit of cholera appeared in very many instances during the course of an attack of the fever. The two diseases *cholera* and *fever*—supposing them to be distinct—certainly masked one another so effectually that diagnosis was extremely difficult at times. The people by the end of October began to show the exhausting effects of the epidemical fever; enlarged spleen, anæmia, debility, jaundice, &c., told fatally on their enfeebled constitutions. This specific fever was strictly confined to the city, and to only those who had to go there. The civil officers all suffered severely, getting frequent relapses. I observed in Kohat in 1869 an outbreak of fever very similar to the Amritsar epidemic, followed by cholera; it was then also observed that it was an impossibility to tell when the cholera commenced, the symptoms of many cases of the fever being so similar." (See History of Cholera in India in 1869, Kohat district.)

Referring to the jail he writes—

"The fever which broke out in the jail, which was in a swamp, and where the prisoners were lying on the damp earth, was distinctly of the ordinary autumnal type, 'malarious,' caused by rise of water-level to the surface in a soil impregnated, not with urine or excrement or dead men's bones, as at Peshawur, but with vegetable matter. This fever was very mild, was curable by chinchona febrifuge or quinine, and left no sequelæ. The civil lines and the district also did not suffer from epidemic fever. The fever which prevailed in the city," he writes, "was a specific fever, masked and frequently interrupted in its course by cholera, to which disease it presented often somewhat similar symptoms, making diagnosis next to an impossibility." He adds—"This fever was highly infectious, whole households being down at the same time, and only those whose duty took them inside the city, living outside, contracted this cholera fever, as it has been called. Quinine did not cure the disease; removal from its vicinity did. The sequelæ of this epidemic fever were severe, and resembled those of relapsing fever."

The cholera, it appears, merged and became lost in this epidemic fever, which until the last occasionally presented symptoms of a choleraic nature.

Dr. Bennett, Deputy Sanitary Commissioner, Eastern Circle, who was instructed to proceed to Amritsar and investigate the nature and peculiarities of the fever prevailing in that city, states in his report on the subject—

"It appeared that the assistant surgeon and hospital assistants, as well as hakims, who had been treating the sick throughout the epidemic, were unanimous in their opinion that the sickness so fatally prevalent was due to malarious fever, and, as far as could be judged from the appearance of the patients themselves, and the statements made by them regarding the symptoms from which they had been, or were still, suffering, the diagnosis appeared to be correct; but owing to the enormous numbers of people daily crowding for relief, the work had been overwhelming, and too great for keeping any record of clinical facts from which reliable data could be obtained. . . . Two great features had been noticed as specially characteristic of the disease, viz., its periodicity—in the vast majority of attacks the febrile symptoms intermitted after from six to ten hours' duration, the paroxysms coming on at a certain time every day or every other day—and the fact that regular administration of anti-periodics—quinine, chinchona febrifuge, &c.—was usually attended with successful results."

From a statement of the ratio of admissions for fever in the police and jail hospitals, compared with the death-rate from fever amongst the city

population, which is shown in the subjoined tabular form, it appears that the epidemic fever commenced at the same time as the cholera, namely, in August; for though the increased death-rate is not shown for the civil population till September, this is explained by the well-known fact that the intermittent fever in its earlier attacks is not generally fatal, and that the death-rates are not affected by such epidemic fever until about a month, more or less, after its commencement.

The hospital figures show that the intermittent fever epidemic commenced in August, at the same time that cholera declared itself in an epidemic form.

STATEMENT *showing ratio of Admissions for Fever in the Police and Jail Hospitals, compared with the Death-Rate from Fever amongst the City Population, Amritsar, in* 1881.

	June.	July.	August.	September.	October.
Admissions for Intermittent Fever per Mille of Strength.					
Police Hospital . .	15·4	8·7	92·0	193·8	55·3
Jail Hospital . .	14·9	6·9	443·7	408·1	60·2
Deaths per Mille from Fevers.					
Amritsar City . .	20·3	15·0	25·20	207·2	386·0

The maximum death-rate reached in October thus indicates the maximum intensity of the fever epidemic in September, which is also the month in which the cholera attained its maximum prevalence and fatality. In other words, these intermittent fevers take about a month or six weeks longer than cholera does to kill their victims, at least in the great majority of cases.

Again, as to the classes affected by this epidemic fever, it was found that, although all classes, without distinction, were more or less severely affected by it, the mortality, as is everywhere observed in the case of cholera, was greatest by far among the poorer classes of the community. It was also found that, from causes more especially affecting them, the poor Muhammadans were much greater sufferers than the poor Hindus, in the proportion of 1.6 to 1.0. The causes above alluded to were these, namely, that the Muhammadan population, a large proportion of it at least, was made up of poor, ill-fed and badly clad Kashmiris, on whom the disease fell heaviest and committed its greatest ravages. At this time also, owing to a prolonged depression in the shawl trade, on which in a great measure they are entirely dependent for their subsistence, these people, about 40,000 in number, were reduced to great distress, and had very largely suffered from chronic starvation when the epidemic fell upon them. The mortality among children was excessively high; out of a total of 6589 deaths from fever registered between 20th August and 31st October, no less than 3531, or more than half, were in children under 12 years of age.

The outbreak in the first instance, there seems no doubt, was due to the excessive rainfall, obstructed drainage, and consequent rise in the spring-level, which produced a more or less complete waterlogging of the soil. The rainfall registered during July and August was 38 inches, or 24 inches above the average for the previous ten years, while that for September was under the usual average. This excessive rainfall was confined to Amritsar and its immediate vicinity, the rainfall in other parts of the district being but little above the average. It flooded the civil station and great part of the ground

round the city, and, as before stated, raised the spring-level to an unprecedented height. In the city the well water rose to within 6 feet of the surface, and in the civil station to within 1 foot, and in some parts of the station for a time the water actually issued on the surface. As a consequence of this excessive stagnation of water, the atmosphere of the locality became heavy and moist to an excessive degree, owing to the drying up of the saturated soil under the influence of a hot sun; and this state of affairs became intensified as the flood-waters began to flow off and subside. As a result of this altered condition of the atmosphere with its diurnal and nocturnal alternations of temperature and humidity, sickness became universally prevalent in the whole of the area affected, and to such a degree that not a single individual, Native or European, in the city and civil station appears to have escaped its attacks. "Nine-tenths of the shops are said to have been closed, and the work of the Government offices was carried on with the utmost difficulty, owing to the general prostration with fever."

The fever was most met with in two forms—"the common intermittent fever, and the rarer but dangerous remittent form to which so many of the city people succumbed; but between these two there were many gradations partaking of characters common to both. . . . Symptoms not infrequently observed at the commencement of the hot stage were violent bilious vomiting and purging, attended with pain and uneasiness in the regions of the stomach and liver, indicative of congestion of these organs, and in cases of long-standing diarrhœa was a common symptom; but in no case," at this late period of the epidemic, did Dr. Bennett "see choleraic symptoms superadded to those of fever. The cholera, in fact, towards the end of October was rapidly on the decline here, as everywhere else in the province, and finally ceased early in November, not only here but all over the Punjab. Although, as before stated, the entire community was more or less individually affected by this fever, the mortality resulting from its attacks was mainly confined to the poorer classes. . . . A notable feature in the case of several children examined was the attenuated condition of the abdominal walls from the great thinning of the muscles, through which the lower part of the spleen could readily be grasped in the hand. In many cases, especially among the poorer people, the body was much emaciated from the combined effects of fever and insufficient and inappropriate diet. In almost all the signs of inanition as well as malarial cachexia were more or less marked; the tongue, lips, and conjunctivæ were pallid and bloodless, the face puffy and dropsical round the eyes, and the skin anæmic, sometimes jaundice, accompanied with liver affection, and not infrequently dropsical swellings of the lower limbs, with, in some cases, general dropsy and albuminuria, indicative of the intensity of the malarial poisoning. Chronic diarrhœa and dysentery were also frequent concomitants, especially after the cold dewy nights of October had set in. In that part of the city inhabited by Kashmiri shawl-weavers almost the whole of the population appeared to be suffering more or less from the depressing effects of malarious cachexia and chronic starvation. The worst forms of this combination were seen amongst children, and particularly amongst infants at the breast, many of whom, their mothers having lost health and strength from frequent or prolonged attacks of fever, were seen to be literally dying of inanition." Among the poorer classes, in many cases, "the sufferers, weakened by excessive attacks and unable to procure suitable food to restore their failing strength, became more and more prostrate, while the paroxysms of fever, continuing to recur, became more and more prolonged, until, the one merging into the other, the disease assumed the remittent or continued form. . . . In others, again, of a more severe character the fever was ushered in by rigors, followed in the hot stage by violent vomiting and purging, with pain in the stomach, liver, and spleen. . . . This last form of the disease was fatally prevalent at the commencement of the outbreak of fever, many people having died from it after a few days' illness only. It was, in fact, frequently indistinguishable from the cholera which was fatally prevalent at the same time, and thus came to be called 'choleraic fever.'"

At a later period, when the evaporation began to decline, both cholera and the rapidly fatal form of fever became less prevalent, and the daily mortality sensibly diminished; but it continued high for some time, higher than in ordinary circumstances of the season, owing to old cases, for want of proper treatment and food, succumbing to the injurious effects of the great

alternations of temperature—hot days alternating with cold dewy nights—to which they were exposed without any means of efficient protection.

It has already been stated that the incidence of the mortality was heaviest on the poorer classes, and especially on those inhabiting the Kashmiri portion of the city. "The vast majority of this class, owing to their inability to earn money to buy food, were found to be in the most impoverished condition, and suffering as much from the effects of chronic starvation as from fever. Although the poor classes in all parts of the city, no doubt, suffered much from deficiency of food, nowhere were the results of poverty and chronic starvation so plainly manifest as amongst the Kashmiri shawl-weavers." But another cause of the high mortality was the deficient and unsuitable clothing of the people; and this evil is much aggravated by the custom so many have of sleeping on the ground with, as a rule, only a thin cotton sheet pulled over them, and a mat intervening between their bodies and the cold damp floor. Infants and children, who are peculiarly liable to suffer from the injurious effects of chill, are also very inadequately protected by clothing against extremes of temperature; the only garment in the case of the former is a cotton cloth of scanty dimensions wrapped round the body, while that of the latter in many cases consists of little more than a cotton shirt barely reaching as far as the knees—the legs being left unprotected.

It thus is shown that in 1881, as in 1869, the epidemic cholera in the city of Amritsar was attended and followed by an epidemic fever, which on each occasion proved more destructive to life and health than the more dreaded cholera itself. In the subjoined tabular form is shown the mortality registered from cholera and fever in the city and suburbs of Amritsar during each of the years 1869, 1879, and 1881, for the sake of comparison:—

Months.	Amritsar City.						Amritsar Suburbs.			
	1869.		1879.		1881.		1879.		1881.	
	Fever.	Cholera.	Fever.	Cholera.	Fever.	Cholera.	Fever.	Cholera.	Fever.	Cholera.
January	146	3	579	...	209	...	...	...	2	...
February	110	4	391	...	154	...	2	...	2	...
March	95	1	371	...	170	1	...	...	...	...
April	133	4	376	160	189	1	2	...	2	...
May	221	16	374	97	193	...	...	1	1	...
June	271	38	366	16	231	1	...	...	2	...
July	381	567	542	114	171	3	...	...	1	...
August	363	2,330	424	83	286	45	...	...	2	...
September	357	75	412	47	2,352	328	2	...	9	...
October	785	2	507	5	4,279	225	...	...	11	1
November	1,268	1	457	...	2,540	8	2	...	5	...
December	634	...	326	2	950	...	...	...	...	...
Totals	4,764	3,041	5,125	524	11,724	612	8	1	37	1
Death-rates	34·99	22·34	37·64	3·25	86·10	4·49	1·29	0·16	5·95	0·16

The figures show an extraordinary increase of fever prevalence coincident with the commencement of cholera activity in 1881, and, compared with the

returns for 1879 and 1869, they show that the excessive prevalence of epidemic fever was earlier in occurrence by about two months than in the earlier years compared. In all three of the years compared the autumnal fever mortality is clearly marked by a considerable rise in the figures for the months of October and November, but even then with very marked difference in the amount of registered fever mortality in these months. In the earlier months, coincident with the prevalence of the epidemic cholera, the returns for 1869 and 1879 do not show anything like the great increase in fever mortality exhibited by the returns for 1881 for the months coincident with the epidemic cholera of that year, although even in them, especially in 1879, some slight increase of fever mortality is traceable concurrently with the prevalence of epidemic cholera. A notable feature in the cholera mortality of Amritsar during the three years compared is the irregularity of its seasonal occurrence. In the corresponding returns for Lahore, in the adjoining district, and only 36 miles distant from Amritsar, the period of cholera prevalence is marked by a very uniform regularity in the months of August and September. In Amritsar no such regularity of seasonal prevalence is observable. In 1869 the figures show that cholera was persistently present from the commencement of the year, though but very mildly prevalent up to the end of April. They show that the dispersion of the pilgrims from the great *Kumbh* fair at Hardwar, about the middle of April of that year, in no way affected the cholera mortality for that month in the city of Amritsar. The months of June and July show the disease to have burst out with epidemic force, and in the following month to have attained its highest intensity, represented by 2330 deaths, or more than quadruple the mortality of the preceding month, July. In September the epidemic suddenly subsided, with only 75 deaths registered in that month. The season of the cholera epidemic of 1869 was in July and August. The fever mortality in this year, like that of cholera, was very mild up to the month of April inclusive. It then, concurrently with the commencing activity of cholera, sensibly increased in May and June, *pari passu* with the mortality from cholera; but in the three following months the cholera and fever mortality diverge from all relative comparison. The cholera mortality suddenly bounds up from 38 in June to 567 in July and 2330 in August, and as suddenly subsides by a drop to 75 deaths in September; while the fever mortality, on the other hand, rising by a sudden increase from 271 deaths in June to 381 in July, remains more or less stationary at about that figure during August and September, entirely unaffected by the great increase in the cholera mortality then prevailing. But in October and November the activity of the usual autumnal epidemic fever is marked by a sudden increase of mortality, akin to that shown by cholera in the preceding quarter both in suddenness and proportions.

In 1879, which was also a year of *Kumbh* fair at Hardwar, the cholera returns for Amritsar show a complete absence of the disease during the first three months of the year, and then a sudden outburst of cholera, represented by 160 deaths in April, coincident with the dispersion of the pilgrims from Hardwar. This suddenly aroused activity of cholera at this early period of the season in this part of the province was not maintained; the mortality declined by nearly a half in the following month, and in the next again—June—fell to just a tenth of that with which it had suddenly started in April. In July, however, the disease recommenced epidemic activity, but in no great force, the mortality being represented by 114 registered deaths; in August the prevalence was sustained at a slightly diminished mortality, and subsided in September, only 5 deaths being registered in

October. The cholera of 1879 at Amritsar shows a sudden and unusual activity of the disease in April, coincident with the dispersion of pilgrims from Hardwar, as well as coincident with the normal period of commencing cholera activity in Northern India generally. The figures also show that this sudden and premature activity of the disease gradually abated in May and June, but in July suddenly recommenced epidemic activity, and again abating, finally subsided at the end of September. During this double revival of cholera activity the course of fever mortality continued unaffected until the second accession of cholera prevalence in July, when, simultaneously with the increased cholera mortality in that month, there was a marked increase in the deaths from fever, the figures rising from 366 in June to 542 in July. This increased fever mortality was not continued in the following months, but subsided by about a hundred deaths in August, and stood at about the same level in September, until, on the subsidence of the cholera epidemic, it again rose in the normal course representative of the usual autumnal epidemic fever. The concurrent rise in fever and cholera mortality in July, though clearly marked, is not nearly so prominent as in the latest of the three years compared, and is noticeable only in the second or normal period of cholera activity in 1879, thus indicating that the later period was a season suited to the activity of both forms of disease, whilst in the earlier period of this year the cholera was forced to a premature manifestation of activity by accidental circumstances, operating in a season of general epidemic cholera influence diffused widely over Northern India. It is to be noted, with regard to the fever mortality of 1879, that it was persistently higher during the first six months of that year than in the same period of either of the other years of the three compared. What influence this higher degree of fever prevalence in the first half of 1879 may have exercised, if indeed it exercised any, in the development of the earlier cholera outbreak in April of that year, is not now easy to determine. But the fact is clear that the unusually early manifestation of epidemic cholera activity in Amritsar in April 1879 was coincident with an unusually early prevalence and fatality of epidemic fever. In the second quarter of the year 1879 the figures do not indicate any very clear association between the concurrent fever and cholera mortality, but in the third quarter such association is distinctly observable. It is more clearly so in the returns for 1881. In 1881 cholera did not appear in the city of Amritsar in epidemic form till the beginning of August, in which month 45 deaths were registered, in September 328, and October 225; in November the last deaths, 8 in number, were registered. During the first six months of the year only 3 isolated deaths had been registered, the last of them in June. Towards the end of July 3 deaths were recorded, and in August, as above stated, the disease became epidemic. From the outset of its appearance in August until the last deaths registered from that cause in November the cholera of 1881 in Amritsar city was associated with an epidemic fever, from which it was in a large number of cases undistinguished. This inability to diagnose the two diseases has been referred to on a previous page, and the confusion of the two forms of disease resulting therefrom is very clearly shown in the mortuary returns of the period under reference.

The fever mortality of the first six months of 1881 was uniform and moderate, with no single feature indicative of a general tendency towards epidemic prevalence. There was an unimportant, but yet distinctly marked, rise in the fever mortality for June, but it was followed in July by a decline to the previously obtaining death-rate preceding the rise in that month. With the commencing mortality from cholera in August there was a very

distinct rise in the fever mortality—from 171 deaths in July to 286 in August; in September the number mounts up to 2352, the deaths registered from cholera being only 328; and in October to 42.79, against 225 cholera; in November the fever deaths are 2540, and the cholera 8; in December the deaths from fever fall to 950. These deaths occurred exclusively in the city of Amritsar, and while the intra-mural population suffered so terribly, there was next to no mortality in the suburbs immediately surrounding them, the cholera death-rate of the suburbs, where but a single death from that cause was registered, being 0.16 against 4.49 in the city, and the fever death-rate 5.95 against 86.10, respectively, per mille of population. Yet the suburbs suffered more severely from the excessive rainfall and rise of spring-level than did the city. The difference in the results is explained by the different life-conditions of the two populations. In the city were crowded together a great mass of poor and starvation-struck people; in the suburbs the people were widely scattered and comfortably off in comparison with the towns-people. The figures show the cholera mortality to be quite overshadowed by that of fever. How much of the excessive fever mortality may be due to real cholera is not so material a point to note as the fact that the two forms of disease prevailed together, and with such similarity of symptoms as to be in a large proportion of cases indistinguishable the one from the other.

The monthly rainfall and cholera mortality for Amritsar in 1881 were as follows:—

1881.		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
	Rainfall .	0·00	1·90	2·60	0·20	1·30	16·80	19·40	18·20	1·90	0·10	0·00	0·00	62·40
	Cholera .	...	...	1	2	1	3	4	49	407	232	8	...	707

Here we find cholera commencing epidemic activity towards the end of August during the drying up after previous heavy rainfall.

Kangra.—Only 37 cholera deaths were registered here, and in altogether 17 places, of which 10 had only single deaths, 4 had less than 4 each, 2 had just 5 each, and the last had 7; of these 17 places 14 were in Palampur circle, and 1 each in Dharamsalla, Nurpur, and Sarwan circles. Of the Palampur villages, Upper Dadh, population 147, and Lower Dadh, population 678, had 5 each, and Pathiar, population 2039, had 7 deaths; these 3 villages are all within a mile or two of each other; the first death here was on 3d June at Upper Dadh, the last on 2d July at Pathiar.

Sialkot.—Altogether 22 places recorded cholera and conjointly registered 313 deaths; in 9 of these places only single deaths were registered, in 7 others the number was less than 5 each, and in the other 6 over 5 each. Sialkot town returned 211 deaths, or more than two-thirds of the entire cholera mortality registered in the district, the first on 28th August, the last on 17th October; Pasrur, population 8276, had 39, the first on 15th, the last on 30th September; and so on with others. During January, April, and July a solitary death was registered in each month. In August cholera appeared in Sialkot town, and in the following month became epidemic in the district. The first case of the epidemic appeared on the 26th August in the small village of Badoki, about 10 miles south-west of Sialkot town, in a Hindu who had returned the previous night from Wazirabad, where cholera was prevalent at the time; he was taken ill at night, and died the next morning. No other case occurred here during the year. In the epidemic cholera of 1875 this village was severely visited, in September, when not less than 68 cases and 26 deaths occurred. The next case in 1881 appeared in Sialkot

town, where an insane beggar, who used to live in the verandah of some shops near the collectorate buildings, was attacked; on the 27th August, it is stated, he ate a large quantity of *chapâtis* (unleavened pancakes) of different sorts of grain, and dâl and rice, which he had collected for the festival at the close of the Muhammadan fast, "and drank, as was always his habit, a quantity of filthy water from a stagnant pool near the well in the mosque compound." On the 28th he was seized with vomiting and purging, and was taken to the dispensary by the police on the afternoon of that day. His case was not at first recognised as one of cholera, but on the 30th "his common bilious stools became like rice-water, vomiting set in, collapse supervened, cramps made their appearance, eyes sank, voice became hoarse, and urine totally suppressed." He was then removed to the cholera hospital, established about half a mile from the dispensary, and ultimately recovered. Next day, "31st August, 15 cases of cholera were reported simultaneously from different, and in some cases quite opposite, parts of the town," and 5 of them proved fatal the same day. On the 1st September 16 fresh cases and 12 deaths were reported, on the 2d 21 and 3, on the 3d 22 and 8, respectively; and so on to the 24th, on which date, for the first time, the daily seizures fell below 10; on the 25th they rose to 14, and thereafter declined to the end of the month; after which to the 11th October, on which date the last seizure was reported, there were only 10, or less than 1 seizure for each day; the last death occurred on 17th October. Altogether from the 30th August to the 17th October there were 500 seizures reported and 211 deaths registered in the city. In the cantonment, about 3 miles distant from the city, cholera appeared on the 31st August, when a Native servant of an officer in the station was attacked; he died. Up to the 11th October, when the last case was reported, there were altogether 37 cases and 23 deaths reported among the Native population.

Next to Sialkot, the town of Pasrur, 19 miles distant, suffered most severely; there were altogether 96 cases and 39 deaths within a period of seventeen days, the first case being on the 14th September. This town suffered also very severely in the cholera of 1875, when 202 seizures and 112 deaths were reported; in the epidemic of 1876, however, it returned only a single death. In the little village of Tahu, population 164, distant 7 miles north-east of Sialkot station, 15 seizures and 10 deaths were registered, the first seizure on 25th September, the last death on 2d October. In Maindurwal, a village about a mile to the north-west of Tahu, there were 25 seizures and 12 deaths, the first on the 26th September, the last on the 8th October. In some of the villages in which isolated deaths were registered it appears that the sufferers were travellers, or had just returned from some affected place; in others they were residents who had not left their homes for some time previously.

The monthly rainfall and cholera mortality for Sialkot in 1881 were as follows:—

1881.		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
	Rainfall .	0·23	2·10	1·37	2·34	0·75	3·01	8·45	10·25	2·53	0·08	0·00	0·07	31·18
	Cholera .	1	...	...	1	...	...	1	6	272	32	...	...	313

Note here that cholera begins at end of August and prevails through September during the drying after the previous heavy rainfalls.

Hoshiarpur.—Altogether 26 places recorded cholera, and returned a total of 331 deaths; 11 places returned only single deaths, 5 others less than 5 each, and the other 10 more. The town and suburbs of Hoshiarpur together returned considerably more than half the entire cholera mortality registered

in this district, viz., 134 deaths in the town and 55 in the suburbs. The first cholera death registered in this district occurred on the 3d May in Hoshiarpur town, the last on the 6th November, a solitary case, in the village of Ladli, Mubarakpur circle.

The following circumstances are recorded in relation to the outbreak of the disease in Hoshiarpur town, population 13,138 :—The first case of cholera observed took place in the town on the 1st May; the sufferer was a man who had eaten a mid-day meal with his family, and in the evening was seized with vomiting and purging, "and died on the fourth day of suppression of urine and coma." The meal referred to consisted of curry made with brinjals and meat, with wheaten *chapátis;* the man was not exposed to heat or fatigue, and no cholera was heard of in the adjoining districts at the time. No other case of cholera was reported till the 14th August, when the first case of the epidemic occurred. The sufferer was a man, a resident of the city, who had undergone a sentence of imprisonment in the Jullundur jail, and was released from jail that very morning, 14th August. He came direct to Hoshiarpur (25 miles distant by road from Jullundur), was seized with symptoms of cholera at 10 P.M., and died next day at 9 P.M.; it is said he first took ill on the way. On the 20th August two more cases occurred in the town, and one of them in the same part of the town where the first case died; both these cases had come in from Jullundur about a week before their seizure. After this cholera became general in the town, and on the 26th August appeared in the suburbs, population 8178. No prevalence of diarrhœa was observed in the town before the outbreak. The disease in the town fluctuated much in its course; on the 11th September it was at its height; it then declined, but on the 20th again increased in severity; between the 17th and 20th it was most virulent, most of the cases between those dates proving fatal "within six hours after seizure;" the disease then assumed a milder type, and steadily declining, ceased in the town on the 3d October, in the suburbs on the 20th. Altogether 328 seizures and 134 deaths were registered in the town, and 126 and 55, respectively, in the suburbs. In some neighbouring villages also the disease was severe.

Regarding the meteorology of the season, it is stated that in June the temperature was higher than that of 1880 in the same month, and "the heat more oppressive, with occasional dusty days, high wind, invariably south-east and south-west;" 4.81 inches of rain fell in June. "In July the prevailing wind was south-east and south-west, and a rainfall of 21.38 inches was registered. The atmosphere was very oppressive and hot, more particularly at the close of the month. Very little thunder and lightning for the season of the year. . . . In August the prevailing wind was south-east and south-west, and rainfall 9.35 inches; yet the number of days on which rain fell was greater than that in July, causing the weather to be very hot, oppressive, and disagreeable. Very little thunder and lightning occurred. The whole of September was hot and oppressive; 3.22 inches of rain registered in two days (18th and 19th), accompanied with thunder and lightning, and slight rain on three other days completed the rainfall in this month; the prevailing wind variable. October was less oppressive and hot; no rain fell in this month, and the prevailing wind south-west."

In reference to the question of the contagious character of cholera, the civil surgeon relates the two following cases :—

"A woman in the town was seized with *cholera*, who had a child 2½ years of age; that child, it was stated, was constantly on the bed with her mother, and on my visit I found the child asleep in her arms, and with her head buried in the mother's *bosom*.

The mother died, and eight days after the child was seized with cholera and died." The other case was that "of a woman who had cholera, and had nursed her infant, eight days old, several times before I saw her; the infant remains uninfected and the mother recovered."

The monthly rainfall and cholera mortality for Hoshiarpur in 1881 were as follows:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1881.	Rainfall .	0·00	1·90	5·50	0·20	1·10	4·80	19·90	8·08	3·07	0·01	0·00	0·00	44·56
	Cholera .	...	...	...	...	1	...	...	27	246	56	1	...	331

Here again cholera prevails during drying up of previous rainfall.

Gurdaspur.—Only 25 places here recorded cholera, and of these 16 returned only single deaths, and in 5 others the deaths did not exceed 3 each, in 2 others they were 6 and 7 respectively, and the 2 last shared the bulk of the registered mortality between them, viz., Batala, population 26,929, deaths 260, the first on 24th August, the last on 18th October; and Gurdaspur, population 4137, deaths 30, the first on the 2d the last on the 23d September. The cholera of the year here was, in fact, mainly confined to the two principal and most populous places in the district. Puthankot, population 4507, had only 7 deaths, all but 2 in September, and the little village of Miádi, population 186, in Nainakot circle, had 6, all in June. This peculiar distribution of the disease in this and some others of the previously noticed districts indicates the concentration of the cholera influence in two or three localities, and its diffusion thence in isolated cases by persons contracting the disease in the localities of its concentrated prevalence, although those thus contracting the disease and dying of it in their homes, scattered about in different parts of the district, did not there spread it as from new centres of activity. The concentration in the one case and the isolation in the other are attributable apparently to the fact of larger numbers of fit subjects being congregated together in the towns than were to be found in the villages.

Regarding the outbreak at Batala, the following particulars are derived from the report by the assistant surgeon:—The first case observed in the town was on the 23d August in a weaver's wife, who died the next day. Some cases of cholera, however, it appears, had occurred prior to this. Thus it is stated that a young man who had gone to Jullundur when cholera was at its height there was attacked by the disease on his return to Sagarpura (a village a few miles from Batala) on the 15th, and that he died in the north-eastern portion of the town on the 20th August; that a weaver's child suffering from cholera had been brought by his parents from here to the Teli gate of the town, near the dispensary—he recovered; that a tailor boy, who had been taken ill at Lahore, was brought by his parents to the centre of the town about the 20th August—he recovered; and that a weaver of Batala, who had been to Lahore only recently, was attacked with the disease in the town on the 20th and died on the 25th August. Following these occurred the first recognised case of the 23d, the mother of the weaver's child brought from Lahore to the Teli gate of the town. On the 25th a woman was attacked in the north-eastern part of the town and recovered; she was a neighbour of the man who died there on that date after coming from the Sagarpura village. On the 26th there were 3 cases in different parts of the town, all in children, 2 of whom died. After this the disease spread rapidly and extensively, and by the end of the month "there was a general epidemic throughout the town." The disease fluctuated in prevalence, gradually rising

to a maximum of 23 cases on the 17th September, then declining for some days, and again suddenly rising from 2 cases on the preceding day to 15 on the 3d October; the disease then abated, and the last death in the town was registered on the 18th October. Altogether 420 seizures were reported and 260 deaths registered.

It is stated that among customs of the people which tend to expose them to the action of the disease is their habit of assembling in large numbers about the sick for condolence or at the house of a deceased for the funeral ceremonies. On such occasions "persons, especially middle-aged women, with their young children, who generally go to condole with each other in cases of death or to see a neighbour patient, may sit on the bare floor, perhaps soiled with cholera discharges, to rub the hands and feet of the sick, and take anything they want to eat without washing their hands; and the young children may pick up food, sweetmeats, or any other similar article lying in the sick-room and put it into their mouths. Under these circumstances it is scarcely possible that those who frequent the cholera-stricken should not fall victims to the disease." Yet, considering the universality of these customs, in this province at least, it is quite exceptional for the visitors on these occasions to contract the disease from the sick or deceased about whose persons and houses they so assemble.

The monthly rainfall and cholera mortality for Gurdaspur district in 1881 were as follows:—

1881.		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
	Rainfall .	0·00	1·20	1·30	0·40	0·10	6·70	12·30	7·50	1·40	0·10	0·00	0·00	31·00
	Cholera .	1	4	...	...	1	6	...	4	276	39	1	...	332

Here we see cholera commencing in June with rainfall after drought, but at once stopped by the heavy fall in that and the two succeeding months; towards the end of August the disease again commences activity, and with the drying up in September prevails as an epidemic.

Jullundur.—Altogether 29 places here recorded cholera, of which 11 returned only single deaths, 6 less than 5 each, and the other 12 more. Altogether 1648 seizures were reported and 865 deaths registered. Jullundur city, population 35,222, registered 421 deaths, the first on 5th August, the last on 26th September; Kartarpur, population 11,053, had 45, the first on 10th August, the last on 1st October; Nurmahal, population 9025, had 51, the first on 24th August, the last on 30th September; Jandiala, population 6607, had 56, the first on 17th August, the last on 7th September; Phillour, population 6251, had 23, the first on 16th August, the last on 27th September; and so on with others.

The first recognised case of cholera in this district occurred on the 5th August in the city of Jullundur, when the son of a water-carrier at the dispensary died of the disease after two days' illness. Inquiry then led to the discovery that three other fatal cases had occurred in the city, viz., one on the 15th July, another on the 26th, and the third on the 1st August. The first of these was a Hindu, aged 32, who, with his brother, kept a sweetmeat shop in a bazar inside the city; he was seized with cholera during the night of the 14th, was removed to a dwelling-house on the morning of the 15th, and there died on that day. The brother also died of cholera during the height of the epidemic. The second case was that of a boy, who had been ailing of fever, but was playing about on the 26th July, when he was taken ill of cholera, and died the next day. The third case was that of

a lad, aged 14, who lived in a house about 50 yards from the dispensary, and died in a few hours after being taken ill on the 1st August. "No connection could be traced between these three cases." The next case was that of the boy in the dispensary before mentioned. Other cases occurred outside the city, viz., that of a European schoolboy who was travelling by railway from Lahore, was taken ill in the train, and removed from it at Jullundur, where he died on the 1st August; and that of a European driver of the mail train from Lahore, who was taken ill soon after the train left Lahore, was removed from it at Lahore on the 2d August, and died there on that day.

It is stated that about this time, "on the 30th and 31st July and 1st August, thousands of persons came by train from Lahore and Amritsar, alighted at Jullundur City Station, went freely to the bazars of the city, visited their friends and relatives at their houses, and some slept the night there; all were *en route* to Chintpurni, a shrine beyond Hoshiarpur, near Parwain Bungalow, but no case of cholera was discovered amongst them." The civil surgeon also notes in his report, from which the above details are derived, comparing the experiences of Jullundur city in the great epidemic cholera of 1879 with those in the epidemic of 1881, that "in that year eighty-eight victims were numbered, and the disease was said to have been spread by pilgrims. In this year, without pilgrims, there was a regular explosion in the city." The cholera deaths registered in the city amounted to 421, and in the suburbs to 172.

After the occurrence of the case in the dispensary on the 3d August, four seizures were reported in the city on the 5th, of which three occurred in the Ali ward, which afterwards suffered more than any other. Another ward approached it very closely in number of seizures and severity of type, and this was the Zila ward, occupying the site of the old fort, on the east side of the city, and its highest part; its east face has a perpendicular drop of 60 feet, whilst the Ali ward, on the west side of the city, is the lowest in level and is skirted by the Grand Trunk Road, and is bisected by an open sewer full of stagnant sewage. From the 6th to the 13th August the whole city became studded with cases, and on and after the last date the epidemic raged with considerable intensity, especially in the two wards above mentioned. The daily seizures numbered from 30 to 40 and upwards; there were 23 fatal cases on the 15th and 24 on the 16th August.

"Panic prevailed about this time, and numbers of people fled in every direction," both by rail and by road. "It was a harrowing sight," writes Dr. Penny, "to visit the low quarters of the town, such as Ali Mohalla, or threading one's way in and out of narrow passages and fearfully crowded dwellings, as in the Zila; often black and cob-webby, perhaps roof falling in, and a running stream of rain-drainage under the *charpoys* the patients were sleeping on. The scenes were calculated to terrify, when, partly from desertion and chiefly from death, it was as though one were in the City of the Dead, the stillness only broken by the wailing of the mourners."

The weather at the time of this outbreak is described as "steamy and oppressive to a degree," and "the air was laden with moisture." During July and August 23.48 inches of rain fell, the greatest amount in any one day being 6.86 inches on the 10th of July; twenty-six days in July were more or less cloudy, and there was not a whole day in August with clear sky. "All around the city we were waterlogged by large accumulations of storm-drainage. The wretched state of rain and damp that prevailed in the mud dwellings in which very many of the cholera cases occurred would hardly be believed. Still up to the end of July there was singular immunity of

disease throughout the Jullundur Doab, as shown in the jail, police, and dispensary statistics."

On the 15th August a prisoner in the jail was attacked with cholera, and was dead at night. The jail, which stands opposite the Ali ward of the city, the Grand Trunk Road running between, was at the time in rigid quarantine. A female prisoner in the lock-up was also attacked; she recovered. It is noted that at the time of the appearance of cholera the Muhammadan fast was being observed, and that the Muhammadans were attacked in much greater proportion than the Hindus. The fast ceased on the 28th August, and the epidemic was at its height from the 13th to the 20th.

In the suburbs, which consist of three or four small towns close together, and 1½ mile from the north-west corner of the city, with which they are in constant communication, no case of cholera was reported till the 15th August, after which date the disease quickly became general there also. In the suburbs "the crowded dwellings, chiefly mud huts, nested together, badly ventilated and fearfully crowded, were of the same description as were found in the city." Both in the city and the suburbs the disease was mostly confined to the poor and the destitute. Of the seizures and deaths reported there were, up to the 16th September:—Seizures 669, viz., Muhammadans 460, Hindus 191, others 18; deaths 339, viz., Muhammadans 215, Hindus 110, others 14. The cantonment, which is 3 or 4 miles distant from the city, escaped with the appearance of but a few cases among the troops, and none at all in the bazar population; nor did any of the villages in the neighbourhood report cholera.

The monthly rainfall and cholera mortality for Jullundur in 1881 were as follows:—

1881.		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
	Rainfall .	0·00	0·70	5·70	0·30	0·40	3·80	16·60	6·66	0·47	0·00	0·00	0·00	34·63
	Cholera .	...	...	...	...	...	...	...	596	246	23	...	...	865

The epidemic cholera here appears to have burst out suddenly and violently with a comparatively light rainfall following a very heavy one, and to have prevailed during the drying up of the saturated soil. The preceding year, it should be noted, was one of heavy rainfall also, and its seasonal distribution between May and September was not very dissimilar to that of 1881 in the same period, but there was no cholera. How far this is owing to the periodical cholera epidemic having run its cyclic course and subsided into quiescence in that year is a question for inquiry.

Gujranwala.—Only 15 places here recorded cholera, and 7 of them only single deaths, and 3 others less than 5 each. Out of a total of 261 deaths registered in this district 153 were returned by the town of Gujranwala, the first on 27th August, the last on 6th October, and 54 by Wazírabad, the first on 18th August, the last on 23d September; Ghakkar, population 2908, returned 20 deaths, all between the 4th and 20th September. The first cholera death recorded in this district was on the 29th March in the small village of Jandali, and it was the only cholera death there throughout the year; the last was on the 24th November in the large village of Uhdowali. After the first case no other cholera death was recorded till the 10th June, when a solitary case occurred in the town of Ramnagar, population 7180. Although cholera had appeared in Lahore in epidemic form early in June, no other case was recorded in this district, "notwithstanding direct railway communication," until the end of July, when the first case was recorded in Gujranwala town on the 30th of that month. "The person attacked was

a Native pleader, who was taken ill with cholera while residing temporarily in the city of Lahore, and who, soon after he was taken ill, was brought in by rail by some of his relatives to his family house in Gujranwala. His wife, who attended him on arrival, was seized the same night, and both died on the following day." Neither of these cases appears in the death returns of the district, nor in the statement of cholera seizures and deaths appended to the report of the civil surgeon from which the above quotation is made. In this cholera statement the only entry on the 30th July is one seizure, without death, in the town of *Wazirabad*, and the first record of cholera in Gujranwala town is on the 6th August, on which date one seizure and one death are entered, and then no other till the 27th August, on which date again a single seizure and a single death are entered; and this last is the first death appearing in the mortuary registers of this town under the head of cholera. Neither was any report of these cases prior to that of the 27th August made, as usual, at the time of their occurrence.

In connection with the cholera of 1881 in this district the civil surgeon writes—

"Its advent was not preceded by any indications of an altered state of health among the inhabitants, such as disturbance of the digestive organs, &c., any more than is usually present when no cholera threatens. But a well-marked sequela fever was very closely associated with its decline. The symptoms of this fever when the attack was slight were in no respect different from those of common quotidian, except that the ague stage was ushered in with vomiting and purging, which invariably ceased in the hot stage, but which recurred again with the return of the ague the next day. But when the attack was severe the patient never got out of the shivering or cold stage. The vomiting and purging became violent, and were accompanied by severe spasms, followed speedily by complete arrest of the functions of the liver and kidneys, insatiable thirst, injected eyes, and death, often within ten or twelve hours." He adds—"Although the monsoons were heavy the autumn was dry, and to this may be attributed that fever so little prevailed at this season of the year."

The monthly rainfall and cholera mortality for Gujranwala in 1881 were as follows:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1881.	Rainfall.	0·20	1·30	1·00	1·40	1·20	3·50	7·00	10·20	0·00	0·00	0·00	0·00	25·80
	Cholera .	...	...	...	1	...	1	...	21	221	16	1	...	261

Here again the epidemic begins with and increases during the drying up after the monsoon rains.

Gujrat.—Altogether 35 cholera deaths were registered in this district, in 4 different places, in 2 of which there were only single deaths. The first cholera death was registered at Kunjah, population 5355, about 7 miles west of Gujrat town, on the 19th August; it was a solitary case, and occurred in a man who had three days before joined a marriage party from Lahore at the village of Thalta. In Gujrat town the first case was that of a man who had returned from a visit to Lahore, and fell ill on the fourth day of his return. The next was that of a man who was removed from the train at the railway station with the disease upon him, and was sent to the dispensary outside the town; he had come direct from Wazirabad. Three cases occurred in one household; a woman, who died, was attacked in a house in the same lane as the above affected household; the last case was that of a woman who had visited the family at Kunjah, one of the members of which had died of cholera, as above mentioned, on 19th August, and fell ill seven days after her return to Gujrat. Altogether there were 7 cases and 5 deaths in Gujrat, the first death on 21st August, the last on 19th September. At Jalalpur, population 14,014, situated 9 miles to the east of

Gujrat, there were 50 seizures and 28 deaths, the first death on 21st August, the last on 15th September. The first person attacked here, it is stated, had been on a visit to Lahore, and was seized within a week of his return. The second and third persons attacked were both taken ill on the same day as the first case; "they were close neighbours, and visited him during his illness." The fourth case was a son of the first, and the fifth was his sister-in-law. The sixth case was the mother of the second. The last 3 were all seized on the 24th August, that is, the day after the first 3 were seized, and all 6 died on the same day that they were attacked, viz., 3 on 23d and 3 on 24th August. The seventh case also occurred on the 24th August (the fourth on that day), and recovered. No other case occurred till the 27th August, when there were 3 seizures and 3 deaths, and then daily seizures and deaths till the 3d September, when the epidemic began to subside.

Jhelum.—In this district only 20 cholera deaths were registered in 7 different places, of which 4 returned only single deaths; the other 3 returned 4, 5, and 7 respectively. The disease was nowhere epidemic in this district. The civil surgeon writes—"Twelve cases of cholera occurred amongst the railway employés, but in almost every case the persons attacked either arrived by train at Jhelum actually suffering from the disease or had come from Lahore, where cholera was epidemic, a short time before they were attacked." Of 13 cases, it is stated that "in nearly all the sufferers were traced as having come from the line of rail a short time before they were attacked."

Rawal Pindi.—A total of 90 cholera deaths was recorded here in 18 places, of which 9 returned only single deaths, and 3 others only 2 each. The first death was recorded in the town of Pindigheb on the 12th July, the last in the city of Rawal Pindi on the 27th November. Regarding the disease at Rawal Pindi the following circumstances are related in the civil surgeon's report:—The first case reported was on the 7th September. It was that of a Hindu lad who had arrived from Lahore by the morning train, and put up at the Sayid sarae. At noon he ate some water-melon and drank some cooling sherbet; at 5 P.M. he had vomiting and purging, and was removed to the city dispensary, where he died on the 10th. Altogether 57 cases and 35 deaths were reported here, the last death on the 27th November. In the cantonment, 1½ mile distant, the first case reported was that of a Mr. ——, who arrived from Lahore by the morning train on 30th August, and was taken ill at 6 P.M. in the railway hotel with vomiting; at midnight purging set in, and he was taken to the city dispensary at about 2 A.M. the next day, the 31st, and there he died on the 1st September at 5 P.M. No other case of cholera was reported in cantonments.

Prior to the appearance of the disease in Rawal Pindi cantonment a few cases of cholera occurred in the Murree Sanitarium; one fatal case among the Natives on the 24th August. Two fatal cases occurred among the European residents of the station towards the end of August, and a sharp outbreak occurred early in September in the camp of European soldiers' families at Thobba, about 6 miles distant from the Sanitarium. The chief feature in the history of all these cases was exposure to the vicissitudes of the cold, wet, and stormy weather then prevailing in these hills whilst in a weak state of health from other ailments, or whilst insufficiently provided with adequate means of protection. Of the two cases at Murree, the first was that of Mr. ——, a civil engineer, aged about 28, who had arrived a few days previously in a very weakly state from the effects of fever at Lahore. The

change of air appeared to improve his condition, and on the third day after arrival he sat for some hours in an easy-chair in the verandah of his house, lightly clad, and exposed to the cold and damp of the weather, with driving mists and showers. He got a thorough chill, was seized with vomiting and purging towards evening, fell rapidly into collapse, and died early next morning. The other case was that of Mrs. ——, the wife of an officer in the depot. She was making a slow recovery from her accouchement twelve days previously, when for the first time she was moved out of her room on to a sofa placed in the open verandah, where for some hours she was exposed to the action of the cold damp air of the place. She soon felt sick and faint, was moved back to her room suffering from violent diarrhœa, quickly passed into a state of collapse, and died at midnight. In both these instances death took place within twelve hours of the commencement of choleraic symptoms. In the family camp at Thobba the women and children were in tents, the walls, and to some extent the floors also, of which were soaked by the heavy rains of the preceding month, and which were now drying up with the closing days of the monsoon rains.

In August, about the same time that cholera appeared in Murree, the disease broke out in two villages of the Hazro circle. On the 20th August the first of 10 deaths from cholera was registered in the village of Gadlati, population under 500, and the last on the 29th; on the 22d the first of 3 deaths was registered in Tájah, population 282, and the last on the 26th. During September cholera was reported in several widely separated parts of the district. Thus a solitary death occurred at Attock, population 3213, on the 7th; on the 12th a death from cholera, followed by 3 more up to the 19th, occurred at Gujarkhan, population 1024, on the Grand Trunk Road; on the 14th a cholera death occurred in Fathullah, population 410, in Hazro circle, and it was followed by 4 more in the same village up to the 24th. On the 17th solitary deaths occurred in Ratial, population 1062, in Gujarkhan circle, and in Kallar Saidan, in Kallar circle; and on the 29th another solitary death occurred in Kallar Saidan, population 2119. On the 23d a single death occurred at Phakrial, population 513, in Rawal Pindi circle; and on the 27th a single death in Dalhousie, population 119, in Gujarkhan circle. In October 3 villages in Rawal Pindi circle registered single deaths from cholera, and 1 in Hasanabdal circle 2 deaths. Several of the deaths reported in the district were in travellers or strangers. Thus that at Phakrial was in the person of a syce who had gone there from Rawal Pindi. At Fathullah the first case was that of a Hindu who had gone to Hasanabdal, where, "after taking a bath and eating some cold food, he became sick of cholera at night," and died next day. The first case in Kallar Saidan was that of a woman who had gone on business to Gujarkhan, and was taken ill of cholera on her way back. She had been accompanied by another woman, who was also attacked at the same time, but recovered. Cholera in this district, with a few local exceptions, did not generally manifest its activity in an epidemic form, and such activity as there was occurred mostly in August and September, which were the months of the maximum intensity of the disease in the affected area of the province generally.

The few other districts affected by cholera in this year call for no particular notice here. They were mostly sporadic cases, widely separated both as to season and locality.

The rainfall of the year 1881, though considerably above that of the preceding year, was still somewhat below the average. In some districts the fall in this year was greatly in excess of that of the preceding (see Table

No. VI.), especially in Amritsar, Lahore, and Jullundur, which all three suffered a severe visitation of cholera in this year.

Summary Review.—In the preceding pages we have traced the history of cholera in the Punjab year by year through the series of twenty years from 1862 to 1881, and from time to time have referred for illustration of the laws governing the appearance and prevalence of the disease in epidemic form to the statistics relating thereto which are embodied in the several tabular statements given at the head of this section.

The records, as tabulated in Table No. V., show that among the troops and jails (for which classes alone of the general population are statistics available during the first three years of the series dealt with in this history) the great epidemic cholera of 1861 in Northern India was repeated in 1862 in the Punjab; that in the following year the disease was in abeyance everywhere in the province, and that it continued so until the autumn months of 1864, when the disease recommenced activity. This activity was apparently most observable in the districts of Ferozepore and Kangra, and also in Dera Ismail Khan.

In the year 1865, for the first time, we have statistics of cholera mortality among the civil population of the province, and from these figures learn the extent of the territorial diffusion of the disease and its seasonal prevalence in this year, and by the corresponding statistics for the subsequent years we are enabled to follow the course of the disease year by year, and compare its prevalence or abeyance with the rainfall and food-supply, which are acknowledged factors in the modification of an epidemic cholera in respect to time of appearance and severity of prevalence.

The monthly average rainfall and the total monthly cholera mortality registered among the civil population for the province as a whole in 1865 are shown as follows:—

1865	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall.	1·49	3·55	3·04	1·14	0·69	0·77	3·75	8·92	5·24	0·03	0·17	2·28	31·07
Cholera.	389	239	196	223	507	483	351	288	170	75	193	196	3,310

The high mortality at the beginning of the year, considered in relation to the rainfall, indicates abatement of the disease from an epidemic climax attained at the close of the preceding year, for the rainfall in the last quarter of 1864 was only 1.12 inches (0.10 in October, none in November, and 1.02 in December) following upon 15.27 in the preceding quarter. The abatement continues till the light fall in April, when, with the increasing temperature and commencement of freer evaporation from the surface of a well-damped soil, cholera renewed epidemic activity. This activity of cholera increased greatly and continued at a high level during the light showers and greater heat of May and June, but sensibly abated with the more copious rain in July, and continued steadily to abate under the heavier falls in August and September. With a trivial rainfall in October the disease subsided considerably, but again revived with freer rainfall in November and December, notwithstanding the very reduced temperature at this season of the year—a circumstance, perhaps, which was not without effect in determining the mildness of the renewed activity.

The year 1866 opened with the epidemic revival of cholera at the close of the preceding year steadily on the decline, but in its course through the several months of the year the cholera of 1866 presented the same features in point of seasonal prevalence as did that of 1865. This is shown in the subjoined statement of the corresponding elements in 1866:—

1866.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	2·03	0·93	0·69	0·68	0·52	2·43	7·90	8·10	0·80	0·27	0·00	0·00	24·35
Cholera .	69	36	49	114	106	116	108	88	84	47	116	118	1,051

The cholera activity which prevailed at the close of 1865 rapidly abated in the opening of 1866, during the coldest period of the year, and in March made little advance from the minimum to which it had sunk in February. But in April, with increasing heat and light showers, as means and material for freer evaporation of moisture from the surface of the soil, cholera broke out into epidemic activity proportioned to the rainfall and previous condition of the soil, which, if not more or less satiated by moisture from the winter and spring rains, was by no means parched by drought to any great extent. This activity of cholera began to increase with the light rainfall in June, affording more moisture than the trivial fall in May could do; but the commencing advance of the epidemic was arrested by the heavy rainfall of July, which served by its abundance to saturate both soil and air more or less with moisture, to the impediment of free evaporation. The heavier fall in August prolonged and increased the intensity of these conditions, and so we find the epidemic cholera, arrested in July, abated considerably in August. In the next two months, with light showers during the drying up of the previous heavy rains, cholera remained stationary or slowly abating; but with the absence of rain in the last two months of the year, and a more active drying up of the previously moistened soil, though under a greatly reduced temperature, the disease again renewed fresh activity. This renewed activity of cholera at the close of 1866 was manifested for the most part in the districts of the Delhi division, in the south-eastern portion of the province, and passed on into the early part of the next year, with the epidemic cholera of which it became continuous.

In 1867 cholera prevailed as a great epidemic in Northern India. In the Punjab its prevalence was universally diffused, and involved the districts which are ordinarily exempt from visitations of the disease in common with those habitually affected by it. The circumstances attending the first appearance of the disease in epidemic form and its diffusion through the province have been described in the history of this year's cholera in preceding pages. Here I proceed to trace the course of the epidemic in its relation to the rainfall. This is shown, in a general way, by the figures of the subjoined statement, which (corresponding, as to elements, with those of the same kind for the preceding and subsequent years of our series) gives the monthly rainfall and cholera mortality for the province as a whole for the year 1867 :—

1867.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	0·44	0·65	0·94	1·55	2·06	0·97	5·57	8.78	1·49	0·13	0·01	0·53	23·12
Cholera .	133	83	296	4,279	8,179	8,461	8,457	7,123	4,525	1,243	321	46	43,146

The cholera activity which commenced with the drought during the last two months of the preceding year was slightly stimulated by the light showers in January 1867, notwithstanding that the temperature of the month was the lowest of any in the year. In February, with slightly increased showers and still low temperature, cholera abated very markedly; but in March, with a slightly increased rainfall and decided advance in temperature, the more or less thirsty soil, which had been barely moistened by the trivial showers of the two preceding months (the only rainfall of any moment since the heavy fall in the preceding August), began to exhale its moisture at a freer rate and with the rapidity of evaporation common to bodies slightly

damped under exposure to dry heat; and with this change in the climatic conditions the subsiding cholera of the preceding month suddenly renewed a more vigorous activity. The light rainfall in April, with an increased advance in temperature, merely sufficed to supply fresh material for quick evaporation from a thirsty soil, and to intensify the climatic conditions characterising the preceding month, and in response cholera activity increased with intensified epidemic energy. In May a slightly freer rainfall and much greater temperature produced from an unsatiated soil a greater intensification of the existent climatic conditions, and with this state of affairs the epidemic cholera acquired increased intensity of prevalence, no doubt largely added to by the peculiar accidental circumstances of this and the following months, which are described in the history of the cholera of this year in a preceding passage. I refer to the movements of large numbers of the people in connection with the Hardwar religious fair, and their exposure under adverse circumstances to the vicissitudes of the weather.

The very defective, or almost absent, rainfall in June, with the hottest temperature of the year, served to dry up the more copious rainfall of the preceding month, and thus to maintain the intensity of climatic conditions already established by the state of the soil and the nature of the rainfall in the preceding months; and with this continuance of the same climatic conditions epidemic cholera maintained a continuance of the same intensity of prevalence, with a tendency to somewhat greater activity. In July occurred the first good fall of the somewhat late-in-arrival hot-weather monsoon rains, but the quantity was insufficient to satiate the long-thirsty soil, and, under the high temperature of the month, only furnished fresh material for the continuance of free evaporation from the surface of a but moderately moistened soil; with this state of affairs in continuance cholera maintained its epidemic activity at the same degree of intensity as in the preceding month. The heavier rainfall in August, though insufficient to at once saturate the soil and air with moisture, sufficed, with the aid of the rainfall in July, to somewhat quench the drought of the soil, and the temperature also, being now on the turn towards a steady diminution, added its share in checking the previous free and rapid evaporation from the soil; with this change and reduction in the intensity of the previously established climatic conditions there occurred in response a change and reduction in the intensity of epidemic cholera activity. The rainfall in September, though in itself light, appears to have sufficed to maintain the satiation of the soil brought about by the plentiful, comparatively speaking, falls in August and July, and this, coupled with the progressing decline in temperature, gave a decided check to the previously very free evaporation of moisture from the soil; coincidently with this check to evaporation cholera abated its activity in a very marked manner. With the rainfalls of July and August the drought of the soil was terminated, and coincidently with this occurrence the climax of the epidemic cholera of the year was determined. The rainfalls in the last three months of the year were very light, and with a satiated soil and low temperature offered no contrasts of drought and rainfall; in these months there was no renewal of cholera activity; the disease continued a steady and rapid abatement to the close of the year.

In 1868 there was no epidemic manifestation of cholera in the Punjab. The great epidemic of the preceding year had ceased entirely before its close, and was not followed by a renewal of epidemic activity in this year. The disease, however, was present in some part or other of the province during every month of the year, but with no very marked prevalence at any parti-

cular season. We have seen the distribution of the monthly rainfall in 1867 in relation to the monthly prevalence of cholera in that year; let us now note the difference in these respects in 1868. The statistics corresponding to those of the preceding year are as follows:—

1868	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	1·07	2·30	1·96	2·00	0·68	2·07	6·05	3·07	0·77	0·07	0·00	0·61	20·65
Cholera .	49	26	30	43	63	60	44	39	42	90	26	20	532

Here we have a considerably more than average rainfall in the first three months of the year, namely, a total of 5.33 inches against a total of only 2.04 inches in the same three months of 1867. The soil was satiated and suffered no drought, whilst the rainfall tended also to moderate the mean temperature of the season in 1868, and thus to produce no abnormal conditions of the climatic elements. In the next three months the rainfall varied little from the average, and was much the same in amount in this year as in the preceding, namely, 4.75 to 4.57 inches respectively. In the next three months the rainfall of 1868 differed greatly from the average and from the fall in the same period of 1867; the total amount was only 9.89 inches against 15.84 inches in the preceding year, and against 17.41 inches, the average fall for this period of the year. The defect, though great, fell upon a more than averagely saturated soil, and there was no violent disturbance of the ordinary evaporation from its surface. In the last three months there was again a marked defect in the rainfall, the total amount being only 0.68 inch against 1.43 inch, the average fall for this period. The deficient rainfall in the last six months of 1868 constituted a continuous period of drought undisturbed by any interval of heavy rainfall, and consequently undisturbed by any violent or sudden divergence from the ordinary course of evaporation from the surface of the soil. The effects of this six months' drought in 1868 will be seen in relation with the following rainfall in the next year; but during this year there was nothing to disturb the continuously increasing drought. With the more than average rainfall in the first half of the year, and the evenly, as to season, distributed defect in the second half, the ordinary course of evaporation from the soil remained undisturbed; and under these circumstances cholera manifested its ordinary activity of non-epidemic years when undisturbed by accidents of rainfall following upon drought. Besides, in this year, the last of the triennial cycle 1866–68, the periodical cholera epidemic was due to terminate its cyclic course in subsidence, and this subsidence was aided, as we have seen, by the nature of the rainfall and its seasonal distribution.

In 1869, the first year of a new triennial cycle, cholera appeared with a fresh revival of epidemic activity, and, as we have already seen, ran its course in the normal order of its cyclic career, namely, intensity in the first year, abatement in the second, and subsidence in the third. It remains for us in this place to trace the progress of the periodical cholera epidemic through the successive years of its cycle in relation with the rainfall of each year. In 1869, although the newly commencing cholera epidemic was very widely diffused over the province (every one of the 32 districts, excepting Muzaffargarh, recording the presence of the disease, albeit in some 5 or 6 of them but a mere presence), it prevailed with marked epidemic activity in only a few of them, especially so in Amritsar, Peshawur, Gurgaon, and Kohat; and in each of these districts the outbreak of cholera was more distinctly preceded by a more or less prolonged period of drought, either comparative or absolute, and was accompanied by a more or less copious rainfall

—the one preparing the soil and air, and the other providing the moisture, for an active evaporation, with the attendant changes of temperature and electric condition. The same sequence of events is found to obtain for the province taken as a whole, as is shown in the following statement of the monthly average rainfall and total monthly cholera mortality for the year 1869:—

1869.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	1·41	0·46	5·24	0·22	0·04	1·60	8·20	3·29	6·35	0·65	0·00	0·21	27·65
Cholera .	18	32	51	76	144	194	797	3,238	2,391	2,033	204	80	9,258

The rainfall in January, coming after the very light falls in the preceding three months, coupled with the lowest temperature of the year, tended to keep evaporation in more than ordinary check, and coincident with this condition we find cholera at the minimum of prevalence in the year. In February, with a much lighter rainfall, and with probably a somewhat higher than the normal temperature of the month, owing to the drought of the latter half of the preceding year, we have the conditions for a more free commencement of evaporation, and at the same time we find cholera beginning activity earlier than usual, the month of February being usually that of minimum cholera prevalence in the year. In March there occurred an unusually heavy rainfall, the effect of which was to satiate the soil and reduce the temperature, and thus to moderate the activity of evaporation; with this condition of soil and air we find the commenced activity of cholera making but moderate progress. The very light rainfall in April coming after the heavy fall in March, and with a naturally increasing temperature, tended to favour a greatly increased activity of evaporation; but the exceptionally heavy rainfall in March appears to have reduced the temperature of April below the normal average, and thus to have restrained evaporation within moderate limits; and with these accompaniments we find cholera advancing with moderated activity. With the still lighter rainfall in May and the increasing temperature of that month, the soil, damped by the heavy falls in March, commenced to give off a freer evaporation; and concurrently cholera moved with greater epidemic activity, though still proportioned to the condition of the soil and quantity of the rainfall. In June the first falls of the hot-weather monsoon rains occurred, but they were very light, and under the hottest temperature of the year afforded but scanty material for fresh activity of evaporation; and so cholera continued to make but slow epidemic progress. In July, however, with a plentiful rainfall coming after three months of more or less severe drought during the hottest season of the year, there were produced the conditions for a freer and more rapid evaporation of moisture from the soil; and concomitantly with this we find cholera making a sudden and great advance in epidemic activity. The plentiful rainfall in July was followed by a great defect in the fall of August, so that the soil and air, instead of becoming saturated by a continuance of heavy rainfall in August, were reduced to a condition tending towards drought whilst the temperature of the season was still very high; under these circumstances evaporation of moisture from the soil acquired a great impetus and proceeded with unwonted activity; at the same time the epidemic activity of cholera acquired a great impetus and increased with unwonted rapidity. The rainfall in September was copious, and, though insufficient to saturate soil and air with moisture, sufficed to somewhat quench the commencing drought of the preceding month and check the very rapid evaporation that had then set in; concurrently with these events, the increasing activity of epidemic cholera, which

had set in in August, in September received a check and commenced to abate. The slight showers and still high temperature in October allowed free play for the evaporation of the copious rainfall in September; under these circumstances the abatement of activity of epidemic cholera which had set in in the preceding month was arrested, and the disease prevailed with an activity little less than that displayed in September. In November, with no rainfall and with a rapidly declining temperature, evaporation was suddenly checked and greatly reduced from the activity obtaining in the preceding month; coincidently with this change of conditions cholera suddenly subsided and sank to a tithe of the activity it manifested in the preceding month. The year closed with some slight showers in December, and with cholera rapidly on the decrease, the force of the epidemic having ceased with the cessation of active evaporation in the preceding month.

1870.—In this year cholera prevailed with greatly less activity than in the year preceding, and nowhere manifested any development in epidemic form. Yet the disease was present in every month of the year and very widely diffused over the province, 28 out of the 32 districts recording mortality from this cause. The rainfall of the year, like that of 1868, was remarkable for its deficient quantity and for its proportionally equable seasonal distribution. The monthly rainfall and cholera mortality for 1870 were as follows:—

1870.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	0·26	0·27	2·01	0·43	0·12	3·71	4·27	6·59	1·94	0·20	0·00	0·34	20·14
Cholera .	29	31	16	33	53	87	52	43	48	22	24	31	469

There are no great contrasts in the monthly rainfall here; still the rise and fall in the prevalence of cholera is strictly in accordance with the rainfall. For instance, the commencing activity of the disease in February is checked by the copious rainfall in March, but again advances with the light showers and greater heat of April and May. The rainfall in June, falling on a thirsty soil, is quickly evaporated; at the same time cholera progresses; the succeeding heavier falls in July and August check evaporation, and at the same time cholera also. The lighter fall in September allows of evaporation from the previously moistened soil with more freedom than under the heavy fall in August, and at the same time cholera overcomes the check of the preceding month and prevails with equal or slightly greater frequency. In the next two months with little or no rainfall the disease abates, and at the close of the year with slight rain again increases.

1871.—In this year, the last of the cycle, cholera prevailed with even less frequency than in the preceding year. The rainfall was considerably more in this year, but its monthly distribution was proportionally equable, and the course of cholera was regulated thereby, as usual. This is well shown in the following statement:—

1871.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	0·24	2·99	0·12	0·35	0·92	6·10	8·41	3·99	1·27	0·02	0·00	0·97	25·38
Cholera .	17	14	22	46	46	50	26	21	20	18	38	51	369

The course of cholera here is in exact correspondence with the rainfall, as already many times illustrated.

In 1872, the first year of the next triennial cycle, the periodical cholera epidemic made its appearance, and ran a normal course through the successive years of the cycle, as in the triennial period preceding. The relation of the epidemic intensity of the first year of its cyclic course to the rainfall of that period is shown in the subjoined statement:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1872.	Rainfall .	1·78	0·90	1·36	0·91	1·40	2·76	10·17	7·66	3·54	0·17	0·02	0·52	31·19
	Cholera .	12	22	18	98	107	3,978	489	2,859	2,424	660	92	2	8,727

Here we see the commencing activity of cholera in February checked by the rain in March, but again advancing with lighter fall and increasing heat in April. The light rain in May afforded fresh material for evaporation, falling as it did on a thirsty soil, and was attended by greatly increased activity of cholera. Towards the end of June the monsoon rains set in heavily, and continued heavy through July, thus saturating soil and air with moisture and impeding free evaporation; the commencement of this rain at once checked the progress of the advancing epidemic in June, and its continuance through July caused a marked abatement in the prevalence of the disease in that month. In August the rainfall was considerably less, though still heavy, and apparently fell at intervals, thus affording periods for evaporation in much activity; in this month cholera renewed fresh activity and acquired greatly increased intensity, and this intensity was maintained, with but little reduction, through September, in which month the rainfall was again less than that of August. In October, with trivial rain and declining temperature, the moisture of the preceding month evaporated less abundantly, and cholera also prevailed with markedly less frequency. In the next month, with very light showers, the disease rapidly subsided, and ceased entirely in December.

The year 1873 had a much smaller rainfall than had 1872, and it was also differently distributed. The monthly rainfall and cholera mortality are shown in the subjoined statement:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1873.	Rainfall .	0·81	0·27	0·76	0·07	2·05	0·38	9·26	6·55	3·59	0·63	0·03	0·77	25·17
	Cholera .	4	2	4	10	11	14	28	4	50	17	2	2	148

The rise and fall in the prevalence of cholera here is in strict accordance with the rainfall, as explained in previous illustrations. The very low prevalence of the disease during the first six droughty months is followed by an attempt at greater activity with the first falls of the monsoon rains in July, but the abundance of the fall in that and the following month completely arrested the progress of the disease, till the much lighter fall in September again gave it encouragement, and this was continued at a much abated degree with the light showers in October. In the last two months, with the establishment of the cold weather and light showers, cholera entirely ceased.

In 1874 the cholera epidemic of the cycle terminated its course, and the disease sank to the minimum of prevalence. The monthly rainfall and cholera mortality for the year are as follows:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1874.	Rainfall .	1·75	1·26	1·67	0·40	0·28	3·65	8·35	5·88	2·83	0·01	0·00	0·04	26·12
	Cholera .	1	1	3	12	9	10	6	11	16	3	4	2	78

Here again cholera, even the little there is, manifests strange sensitiveness to the effects of evaporation as that is influenced by rainfall and drought, and precisely as has been many times before explained.

In 1875 a new triennial cycle commenced, and the periodical cholera epidemic made its appearance in due course. The epidemic did not run its successive annual course with the usually well-marked distinction of intensity, abatement, and subsidence in the successive years, but prevailed with about

equal intensity during the first two years, and then suddenly subsided to minimum prevalence in the third year. This was owing to the exceptional distribution of the epidemic in the first two years to different halves of the province, as has been before described in the history of the cholera of these two years, 1875 and 1876. In the former year cholera was epidemic in the Punjab, but only in its eastern half. In the latter year the disease again prevailed as an epidemic, but only in the western half of the province. In both years the epidemic activity of the disease commenced in the month of June and terminated in that of November. The course of cholera in the Punjab during these two years presents a notable exception to the general experience of the disease in this province, and it will be convenient here to consider the epidemic of the two years together. The commencement and course of the disease in each year has been described in a preceding passage, and the different areas affected by it have been clearly indicated. I proceed, therefore, now to present the monthly rainfall and cholera mortality of these two years, first for the province as a whole, and next for the different halves affected by the epidemic of the successive years.

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1875	Rainfall .	0·24	2·14	0·37	0·04	1·23	1·20	8·26	10·52	10·15	0·78	0·32	0·65	35·90
	Cholera .	4	4	4	10	41	316	747	1,515	2,117	1,358	129	1	6,246

Here we see cholera first commencing activity in April during drying up of the preceding rainfall; the light fall on a drying soil in May encourages the progress of the disease, and the equally light fall in June, the hottest month of the year, forces it into epidemic activity. The heavy falls in July, August, and September hardly suffice to saturate a soil parched by a more or less severe drought during the preceding nine months, and the epidemic flourishes, but not to any great degree of violence. In October, with light showers and declining temperature, following the abundant rainfall of the preceding three months, there was still some considerable evaporation going on, and cholera, though abating, continued very active. In November, with trivial rain and fast-falling temperature, the epidemic suddenly subsided, and cholera soon ceased activity entirely.

The monthly rainfall and cholera mortality in 1876 were as follows:—

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1876	Rainfall .	0·64	0·67	1·82	1·30	1·06	1·10	11·44	5·77	2·67	1·45	0·42	0·17	28·51
	Cholera .	4	7	2	6	8	236	1,096	1,396	1,421	1,277	280	3	5,736

Here we have a heavier rainfall, and more equally distributed, in the first six months of 1867 than in the same period of 1875, and we see the attempt at increase of cholera in February suppressed in the following months until June, when, with a light fall and the hottest temperature of the year, cholera broke out into epidemic activity. The disease made some considerable progress under the heavy rain of July, but still greater under the much lighter falls in August and September; and under the yet lighter fall in October, though beginning to abate, cholera was still very active. In November, with a trivial rainfall and the setting in of the cold weather, cholera suddenly subsided, and soon ceased altogether.

The examples afforded by these two years, 1875 and 1876, are hardly fair illustrations of the relation between cholera prevalence and rainfall, because the cholera mortality is mainly that of one-half of the province in each year, whilst the rainfall is in both years the average for the whole

province. In 1875 cholera was preceded by nine months of drought, partially absolute, but more generally comparative; and this drought, during the first six months of the year, was more pronounced in the eastern districts of the province than in the western, taking the Rivers Ravi and Lower Sutlej as the lines of separation between the two sets of districts; for, excluding the two hill districts of Simla and Kangra in the eastern division, the total rainfall of the other fifteen districts during the first six months of the year was only 55.13 inches against the total rainfall of 63.37 inches during the same period in the fifteen western districts. In the following year, 1876, the rainfall during the first six months was greater in the western than in the eastern districts—the same fifteen districts in each division—the total rainfall during that period in the former being 102.41 inches against only 74.44 inches in the latter, thus showing the existence of six months of comparative drought in the western districts antecedent to the epidemic cholera of each year in their respective areas. This will be more fully illustrated a little further on.

With reference to the cholera epidemic in the North-Western Punjab in 1876, it has been recorded that the disease spread into Kashmir from the Sialkot district towards the close of the epidemic of 1875 in the South-Eastern Punjab. In Kashmir territory the disease appears to have continued prevalent all through the winter and far into the spring months of 1876, but apparently with no very great epidemic activity, and to have spread into the adjoining districts of the Punjab on the approach of the hot-weather rainy season, and thence to have extended in the direction of the advancing monsoon. It is, at all events, quite clear that the cholera epidemic of 1876, commencing in the north-western portion of the province, where the epidemic of the previous year ended, was confined to that portion of the Punjab, and did not extend into the south-eastern portion of the province, which was already swept by the periodical monsoon advancing upwards to the north-west. The cholera of the two years 1875 and 1876 in this province may be considered as the continuation of one and the same epidemic, the activity of the disease being kept up in Kashmir during the cold weather interval of its quiescence in the Punjab districts, and extended to the adjoining portions of the Punjab on the arrival of the periodical season favourable to its development and spread with the advancing season. Whatever may be the explanation of this prolonged and intermittently progressive cholera epidemic of the years 1875 and 1876, there is the broad fact that the epidemic of the earlier year, commencing in the south-east, spread steadily along the route followed by the monsoon towards the north-west, and that the epidemic of the later year, commencing in the north-west, spread onwards in that direction with the monsoon, and not against its current towards the south-east. The aggregate rainfall of the third quarter of 1876—the medium year of the triennial cycle 1875–77—was, as has been stated, unusually heavy for that year of the cycle, as was the fall of the corresponding quarter of the preceding year of maximum rainfall of the cycle exceptionally heavy for that year of the cycle.

The inference from these facts seems to be, that the monsoon of 1875 failed to afford the requisite conditions for the development of the cholera influence at the line marked by the River Ravi and the district of Sialkot beyond it, whilst that of 1876, meeting the cholera-producing influence at that line, afforded the requisite conditions for its development into activity in the course of its own normal progress.

And that this was actually the case seems proved by the recorded distribution of the rainfall during those two years. In the subjoined comparative statements are shown the total aggregate rainfall for the first two quarters and for the whole year, together with the cholera deaths registered in those

periods, respectively, in the eastern and western districts of the province for the years 1875 and 1876. The rainfall is taken from the monthly statements attached to the district returns for this province, and the figures show that in 1875 the drought of the first six months of that year was greater in the eastern than in the western districts, whilst the monsoon rainfall of the year was much heavier in the former than in the latter districts. The total rainfall during the first six months of 1875 was 63.37 inches out of a total rainfall during the whole year of 324.51 inches in the fifteen western districts, whereas it was 103.56 and 824.37 inches respectively in the seventeen eastern districts. But if from these last we exclude the two hill districts of Kangra and Simla, then the total rainfall during the first six months of 1875 will be 55.13 inches out of a total rainfall during the whole year of 576.18 inches in the other fifteen districts of the eastern division. Thus the monsoon rainfall, speaking generally, is represented by 261.17 inches of rain in the fifteen western districts against a monsoon rainfall of 521.05 inches in the fifteen eastern districts. In other words, the monsoon rainfall of 1875, whilst exceptionally heavy in the eastern districts, failed to a considerable extent in the western districts. Coincident with this distribution of the rainfall in 1875 we find cholera epidemic in the eastern districts and in marked abeyance in the western districts; that is to say, active with abundant rainfall after drought, and quiescent with diminished rainfall after no drought. In 1876 the distribution of the rainfall was the reverse of that which obtained in the preceding year, and with it also the distribution of the cholera of the year was reversed. During the first six months of 1876 the total rainfall in the eastern districts was 109.88 inches out of a total rainfall for the whole year of 602.36 inches, exclusive of the two hill districts of Kangra and Simla, it was 74.44 and 382.23 inches respectively in the other fifteen districts of this division, whereas in the fifteen western districts the total rainfall in the first six months of 1876 was 102.41 inches out of a total rainfall for the whole year of 309.74 inches. Thus the monsoon rainfall of 1876 is represented by 307.79 inches in the fifteen eastern districts, and by 207.33 inches in the fifteen western districts, against 521.05 and 261.14 inches respectively in the preceding year, which leaves a considerable comparative preponderance of the rainfall of the year on the side of the western districts, in which the rainfall of the first half of the year was absolutely greater than in the fifteen eastern districts during the same period in the proportion of 102.41 inches to 74.44 inches respectively. Coincident with this diminished rainfall in the eastern districts we have cholera in marked abeyance everywhere, except in the Lahore and Sialkot districts, adjoining those of the western division; whilst in the western districts, with an unusually heavy rainfall in the first half of the year and a comparatively abundant, though absolutely diminished, monsoon rainfall, we have cholera in epidemic prevalence. The facts tend to show that in 1875 the monsoon rains after drought in the eastern districts produced unusually active evaporation from the parched soil, and that this was coincident with epidemic cholera in those districts, whilst that in 1876 the evaporation of moisture from the soil was most active in the western districts as a consequence of the unusually heavy rains in the first half of the year and the absolute diminution of the monsoon rains, and that this was coincident with cholera in those districts. In the former year a comparatively dry soil produced the evaporation, and in the latter a comparatively dry air. Such appear to be the results deducible from the facts. However, be this as it may, the cholera epidemic of 1875 and 1876 in the Punjab, like the two preceding epidemics of 1869 and 1872, was followed by two years of almost complete cholera abeyance in this province.

COMPARATIVE STATEMENT *showing the Rainfall in the First Six Months and for the Year, together with Cholera Deaths, in the Western and Eastern Districts of the Punjab Province for the Years 1875 and 1876.*

WESTERN DISTRICTS.

Districts.	1875. Rainfall in Inches.		1875. Cholera Deaths Registered.		1876. Rainfall in Inches.		1876. Cholera Deaths Registered.	
	First Six Months.	Year.	First Six Months.	Year.	First Six Months.	Year.	First Six Months.	Year.
Jhelum	2·80	28·30	1	1	8·80	20·20	40	301
Gujrat	3·60	31·30	1	2	10·70	42·30	2	572
Gujranwala	4·20	46·20	1	9	7·60	32·90	2	272
Shahpur	3·00	11·00	...	...	6·60	16·00	157	504
Rawal Pindi	6·50	48·80	1	1	15·47	37·63	2	626
Hazara	16·90	55·90	...	...	14·80	52·30	...	245
Peshawur	5·50	18·60	1	2	7·50	13·30	...	638
Kohat	8·00	28·60	...	...	9·20	23·30	...	24
Bannu	4·80	16·20	...	...	5·90	12·00	...	998
Dera Ismail Khan	3·26	8·78	1	2	7·07	11·53	1	240
Dera Ghazi Khan	1·90	7·90	1	1	1·90	10·60	4	5
Muzaffargarh	...	5·30	...	...	0·66	8·70	...	...
Mooltan	1·91	7·43	...	1	3·57	15·48	...	32
Jhang	0·20	8·30	...	...	1·70	5·20	...	3
Montgomery	0·80	1·90	...	2	1·00	8·30	...	1
Totals	63·37	324·51	7	21	102·41	309·74	208	4,461

NOTE.—The 40 deaths in Jhelum and 157 in Shahpur all occurred in the month of June 1876.

EASTERN DISTRICTS.

Districts.	1875. Rainfall in Inches.		1875. Cholera Deaths Registered.		1876. Rainfall in Inches.		1876. Cholera Deaths Registered.	
	First Six Months.	Year.	First Six Months.	Year.	First Six Months.	Year.	First Six Months.	Year.
Ferozepore	1·60	29·00	...	1	3·10	13·50	...	...
Sirsa	1·20	19·30	3	26	3·10	17·50	1	1
Hissar	2·90	25·20	5	142	2·60	20·80	...	...
Rohtak	1·90	30·10	90	239	4·60	17·60	17	17
Gurgaon	3·00	45·50	50	526	5·10	30·80	12	13
Delhi	2·20	38·20	78	287	6·50	18·90	2	2
Karnal	7·80	38·40	...	72	4·50	20·00	1	1
Umballa	4·00	33·80	115	349	5·20	28·50	7	7
Simla	23·83	91·39	4	158	17·64	79·33	...	...
Ludhiana	3·63	36·18	2	83	4·44	15·63	1	2
Kangra	24·60	156·80	15	710	17·80	140·80	3	3
Hoshiarpur	6·30	44·60	2	236	9·80	34·30	...	...
Jullundur	5·60	55·70	1	63	8·20	27·10	...	...
Amritsar	4·10	43·00	1	1,269	2·90	30·50	2	30
Lahore	4·00	33·20	4	288	2·50	21·50	8	722
Gurdaspur	3·70	55·10	1	1,482	4·80	35·00	1	14
Sialkot	3·20	48·90	1	294	7·10	50·60	...	463
Totals	103·56	824·37	372	6,225	109·88	602·36	55	1,275

NOTE.—Of the cholera deaths in Rohtak, Gurgaon, Delhi, Umballa, and Kangra during the first six months of 1875, almost all occurred in the months of May and June.

In 1877, the last year of the cycle, cholera subsided to a minimum of prevalence. The rainfall of the year was somewhat more than that of 1876, and it was also above the average; but its most remarkable feature was its exceptional seasonal distribution, as has been already described in a preceding passage. The monthly rainfall and cholera mortality for 1877 are as follows :—

1877.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	2·91	3·28	1·36	2·37	1·62	2·24	2·71	1·06	3·30	1·38	2·41	4·39	29·03
Cholera .	2	2	2	3	7	3	2	1	4	1	2	...	29

The heavy rainfall of the first six months amounted to 13.80 out of the total 29.03 inches of the year, and thus nearly equalised the fall throughout the year. The absence of drought or contrasts in the monthly rainfall is very remarkable, more especially in connection with the absence of cholera activity.

The year 1878, the first of the next triennial cycle, was marked by a revival of epidemic cholera activity, but it was of the mildest kind, and limited to two adjoining districts in the south-eastern part of the province. The periodical cholera epidemic made its appearance with the first year of the cycle, but it was very late in arrival, and was completely eclipsed by the epidemic of the following year, which prevailed with an intensity more usually characteristic of the first year of the cycle. In the third year, however, the epidemic completely subsided. The unusual mildness of the cholera of 1878 was due to the nature and distribution of the rainfall. The monthly rainfall and cholera mortality for the year are as follows :—

1878.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	1·01	2·73	0·25	2·53	2·82	0·94	7·11	11·96	1·40	0·30	0·00	0·18	31·24
Cholera .	1	4	...	...	...	2	32	70	70	8	27	1	215

The rainfall of the first half of the year was pretty evenly distributed over the several months, and was abundant in quantity, being about 2 inches in excess of the average for that half of the year. The fall in the last half of the year was seasonably distributed, and was also very abundant, being over 2 inches above the average fall for those six months. The rainfall of the year, indeed, was unusually abundant, and its monthly distribution was such that there was no drought till the last quarter of the year. The effects of this drought are seen in the next year's cholera.

In 1879 cholera prevailed with unwonted epidemic severity for the second year of the cycle, and this unusual activity was due to the peculiar nature and seasonal distribution of the rainfall, which, whilst greatly less than that of the preceding year, as also than the average, was, besides, very unequally distributed. The monthly rainfall and cholera mortality for 1879 are as follows :—

1879.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	0·05	0·24	2·16	0·06	0·18	4·38	5·16	8·68	1·82	0·05	0·00	0·78	23·56
Cholera .	7	4	2	2,603	9,184	7,085	3,457	2,705	914	147	7	20	26,135

The three months of drought at the end of the preceding year were followed by two more in the beginning of this, and then came the rain of March. It was followed by drought again in April and May, the months in which the first great rise takes place in the increasing summer temperature, conditions favourable to the free play of evaporation from a slightly damped soil. With the drying up of the March rainfall in April cholera broke out with considerable epidemic violence, and increased rapidly and greatly in May.

In June, however, the monsoon rains set in early and heavily, and were followed by successively heavier falls in July and August. The effect of the heavy rainfall in June was to arrest the increasing progress of epidemic cholera and cause a marked abatement in the activity of the disease; the effect of the succeeding heavier falls was to suppress the activity of the disease still more in each succeeding month, until, with the lighter falls and diminished temperature in September and October (the soil being thoroughly saturated by the preceding heavy rainfalls, and evaporation rapidly on the decline), the epidemic suddenly subsided, and finally ceased in November.

Like the previous great epidemic cholera in Northern India in 1867, the great epidemic cholera of 1879 was characterised by exceptional severity and widespread diffusion, and, as in the previous great epidemic, was concurrent with a similar train of exceptional circumstances injuriously affecting the general health standard of the people at large, namely—(*a.*) high prices of food, and widespread distress among the poorer classes in consequence; (*b.*) an unusual travelling about during the first two or three months of the epidemic of great multitudes of people in connection with the pilgrimage to Hardwar, and the journey back to their homes in the most distant parts of the province; and (*c.*) an exceptional amount of exposure to weather of vast numbers of persons of both sexes and all ages, the majority of whom were more or less poor and destitute pilgrims, and who were more or less generally wearied and worn by the exposures, fatigues, and privations inseparable from the sort of camp-life and journeys to which they subjected themselves at the most trying season of the year.

By reference to the quarterly rainfall shown in Table No. V., and to the monthly rainfall given on preceding pages of this summary review, it will be seen that there was a markedly singular parallelism in the seasonal distribution of the rainfall immediately antecedent to, and concurrent with, each of these two great epidemics of cholera. The year 1867 was preceded by a period of drought, comprising the last quarter of 1866, whilst the rainfall of the next three months, constituting its own first quarter, was greatly below the average. The year 1879 was similarly preceded by drought in the last quarter of 1878, and this was followed by very defective rainfall in its own first quarter. For facility of comparison the figures are reproduced in the subjoined statement:—

Years.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
1866	...	...	...	0·27	24·35
1867	2·04	4·57	15·84	0·67	23·12
1878	...	...	...	0·48	31·24
1879	2·45	4·61	15·66	0·84	23·56

Both in 1867 and in 1879 the epidemic cholera of the respective years commenced with a sudden outburst in the month of April, and finally subsided in November, but that of the earlier year was by far the most severe and destructive. In both instances the disease broke out in epidemic form coincidently with the first heavy rains after a prolonged period of more or less severe drought, and—a point of no less importance—coincidently with a rise in temperature from that of the winter to that of the summer months. Both years also were medium years of their respective triennial cycles.

In 1880 the cholera epidemic of this cycle terminated its course, and

the disease subsided to a minimum of prevalence. The rainfall of the year was very similar to that of the preceding both as to amount and quarterly distribution. The monthly rainfall and cholera mortality for 1880 are as follows:—

1880.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	0·37	1·65	0·01	0·09	0·70	3·63	10·28	2·54	2·25	0·00	0·14	0·87	22·53
Cholera .	1	3	6	9	7	15	8	33	14	120	55	3	274

In explanation of the slight difference between the rainfall of 1879 and 1880 and the great difference between the cholera of the two years, it is to be borne in mind that 1879 followed a year of unusually heavy rainfall, the rainfall of 1878 being 31.24 inches against 27.37 inches, the average; whilst 1880, itself a year of very defective rainfall (22.53 inches), followed a year of defective rainfall little short of its own defect, the fall in 1879 being only 23.56 inches. So that the cholera of 1879 occurred in a year of drought after a year of unusually heavy rainfall, when the soil had moisture for evaporation; whilst the cholera of 1880 occurred in a year of drought following a year of drought, when the soil had comparatively little or no moisture for more than the ordinary evaporation.

In 1881, the last year of the series of twenty dealt with in this history, and the first of a new triennial cycle, the periodical cholera epidemic made its appearance and prevailed with considerable epidemic activity, though with no violent severity.

The monthly rainfall and cholera mortality of the year are as follows:—

1881.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Rainfall .	0·12	1·21	2·48	1·54	0·73	3·16	8·52	7·09	1·40	0·14	0·00	0·08	26·47
Cholera .	3	4	4	5	37	178	183	1,649	2,560	545	38	1	5,207

Here again cholera commences activity with the drying up in May of the rainfall in April, increases with the first rains in June, is arrested in progress by the heavy fall in July, again progresses rapidly with the lighter fall in August, and increases greatly under the drying up with the slight fall in September; in October, with diminished temperature and trivial rainfall, the epidemic abates, but the disease is still active, and finally subsides in November, with no rain and the cold weather setting in.

We have now followed the course of cholera in relation to the rainfall in the Punjab Province throughout the series of years for which the statistics are available. The same sequence of events is traceable with respect to cholera prevalence and rainfall in all the other provinces of India. Everywhere the statistics show that rainfall after drought, or drought after rainfall, with a certain high degree of temperature, or of temperature above the normal heat of the season, is favourable to the epidemic prevalence of cholera, and is almost always accompanied by epidemic cholera; whilst rainfall, whether heavy or light, on a saturated or already moistened soil, with a certain low degree of temperature, or of temperature below the normal heat of the season, is unfavourable to the prevalence of epidemic cholera, and when occurring during the course of such an epidemic, invariably checks its progress or suppresses its activity more or less quickly and completely.

Another interesting feature presented by the returns in the tabular statements for the Punjab is the progressively diminishing mortality registered from cholera in each succeeding epidemic, and in late years generally. The mortality registered in the great epidemic of 1879 was not very much more than half that registered in the corresponding great epidemic of 1867, the deaths being 26,135 and 43,146, and the ratios 1.49 and 2.45 respectively.

Excluding these two extraordinary epidemics, the other ordinary cholera epidemics during the period over which our statistics extend are shown below in contrast, with their registered mortality and death-rate per mille of population :—

Years.	Deaths.	Rate.
1869	9,258	0·53
1872	8,727	0·50
1875	6,246	0·36
1876	5,736	0·33
1881	5,207	0·30

This steady decrease in the mortality registered in successive cholera epidemics in the Punjab is probably, in a great measure, due to the considerable sanitary improvements effected during late years in the principal cities and municipal towns, as well as to more successful curative treatment; but there is no doubt, at the same time, that the decrease is partly attributable to a growing disposition to reject as cholera those cases in which the most prominent and characteristic symptoms of the disease are not clearly marked, such as suppressed urine and rice-water stools. The results, as they stand, however, are very encouraging, and afford hope of the final extinction of the disease, as a pestilence at least, from this province, by a steady perseverance in the improvement of the sanitary conditions alike of the people and of their dwellings.

So far our remarks have dealt with the results obtained in regard to the province as a whole. In the annexed tabular statement (Table No. I.) are shown the statistics of cholera mortality for each of the thirty-two districts of the province separately for the series of years from 1865 to 1881 inclusive.

It will be observed that the incidence of the disease has fallen very differently upon the several districts, not only for the whole series of years taken together, but also in the successive years of the series, especially the successive epidemic years. Some districts have suffered in every year, and have regularly been affected by each succeeding epidemic; some districts, whilst showing a steady persistence of cholera in almost every year of the series, have escaped one or more of the general epidemic visitations, as is particularly observable in the districts of Gujrat and Jhelum, which lie in the direct line of the route followed by successive epidemics advancing up the province; other districts, again, show a more or less general immunity from cholera even in years of its general epidemic prevalence, as the districts of the Mooltan and Derajat divisions. The vertical columns of each year in the tabular statement will illustrate the general diffusion of the cholera of the several years of the series for the province generally, whilst the transverse lines show the annual mortality from cholera registered in each district for the several years of the series. The monthly distribution of the annual cholera mortality in each district of the province is shown in Table No. II. The history of the cholera of each district is a study of itself, and in order to aid the understanding a knowledge of the general physical features and climatic peculiarities of each district is necessary. But to introduce such descriptions here would greatly add to the bulk of this work, and they have therefore been omitted.

Generally speaking, it is found that those districts in which cholera is most prevalent are distinguished from those in which the disease is habitually

absent or only occasionally prevalent by the following constant conditions of peculiarity, viz. :—(*a.*) The districts in which cholera is more or less persistently present, and in which it prevails with activity in each successive epidemic year, are situated in the area traversed by the currents of the south-west monsoon. (*b.*) They receive a heavier rainfall and possess a moister atmosphere than the districts which are habitually free from cholera. (*c.*) They are more subject to sudden and great alternations of temperature, producing "damp chills," than the districts which are situated outside the area influenced by the seasonal monsoons. (*d.*) Most of the districts in which it is found that cholera is more or less steadily persistent all through the year are characterised by the presence of greater or less areas covered either by marshes or by stagnant pools, or by obstructed drainage producing a water-logged soil, or by canal-irrigation.

What part these conditions play in favouring the manifestation of cholera activity is not easily to be determined in the present state of our knowledge concerning the actual nature and cause of cholera. That cholera frequently occurs and even persistently prevails in sporadic form in tracts of country characterised by the conditions of soil and climate above described is an indubitable fact, but for its development into epidemic prevalence and diffusion something more is required. And this something is the presence of the cholera influence, whatever that may be. All that is certainly known regarding it in the Punjab is the simple fact of its being a concomitant of the monsoon seasons. During the sixteen years for which we have the statistics in the Punjab cholera has never originated, nor prevailed, as a general epidemic in this province during the cold-weather months. The rule for its seasonal prevalence is, minimum activity or absolute quiescence at the periods of the spring and autumn equinoxes—March and September respectively—a commencing activity with more or less regular uniformity in the month of April, and a continued prevalence—epidemic or sporadic—during the succeeding months up to the middle or end of September, but sometimes prolonged, more especially in the extreme north-west of the province, through October to the early part of November.

Epidemic cholera prevailing through the winter months is unknown in the Punjab. The period of prevalence of any single general epidemic in this province, as a rule, does not exceed six months. If the epidemic begins in April it ends in September, if in May in October, and if it commence only in June it may go on until November. In the north-western parts of the province the tendency is towards a summer or rainy-season prevalence. The spring and winter months are generally months of freedom from cholera prevalence in all parts of the province. But occasionally local epidemic outbreaks of cholera have occurred in November and December, and continued into the following January and February, in the extreme south-eastern districts of the province, Gurgaon and Delhi. These, however, have subsided either in December or in the February following, and, on the occasions on which they have been observed, have proved to be forerunners of great general epidemics of cholera affecting the province in the following April, as in the instances of 1867 and 1879 already alluded to. Of the thirty-two districts in the Punjab, those of Ferozepore and Delhi are the only ones which have ever recorded epidemic cholera during the winter months, Ferozepore in 1865–66 and Delhi in 1866–67.

A notable feature in the deportment of epidemic cholera in the Punjab is the very unequal distribution of its incidence, not only in the districts, but in the different parts of the districts affected. This is very clearly

shown by the cholera-distribution statements attached to the cholera maps furnished with the annual provincial sanitary reports for the several years for which the information is available. These statements show that in each district affected by the disease a few centres of habitation—towns or villages —are visited by more or less severe outbreaks of cholera; that a few more, somewhat more numerous, are visited by mild outbreaks of the disease; and that usually half, more or less, of the places affected by cholera in each district visited by the disease during seasons of its epidemic prevalence are affected to the extent of only solitary fatal cases of the disease, and in most of these instances it is found that the victims were either travellers or others who had recently, or immediately before attack, visited places in which the disease was actually prevalent. At the same time, the statements show that the places returning deaths from cholera in the several districts affected by the disease in epidemic form constitute but a very small proportion of the total number of places or centres of habitation in each district so affected. The proportion of affected to non-affected places in each of such districts varies not only in the different districts, but also in the same district in successive epidemic seasons, according to the accidental incidence of the prevailing influence. In all cases and seasons, however, the disproportion between the affected and the non-affected places is very strongly marked.

SECTION XI.

CHOLERA IN INDIA FROM 1862 TO 1881.

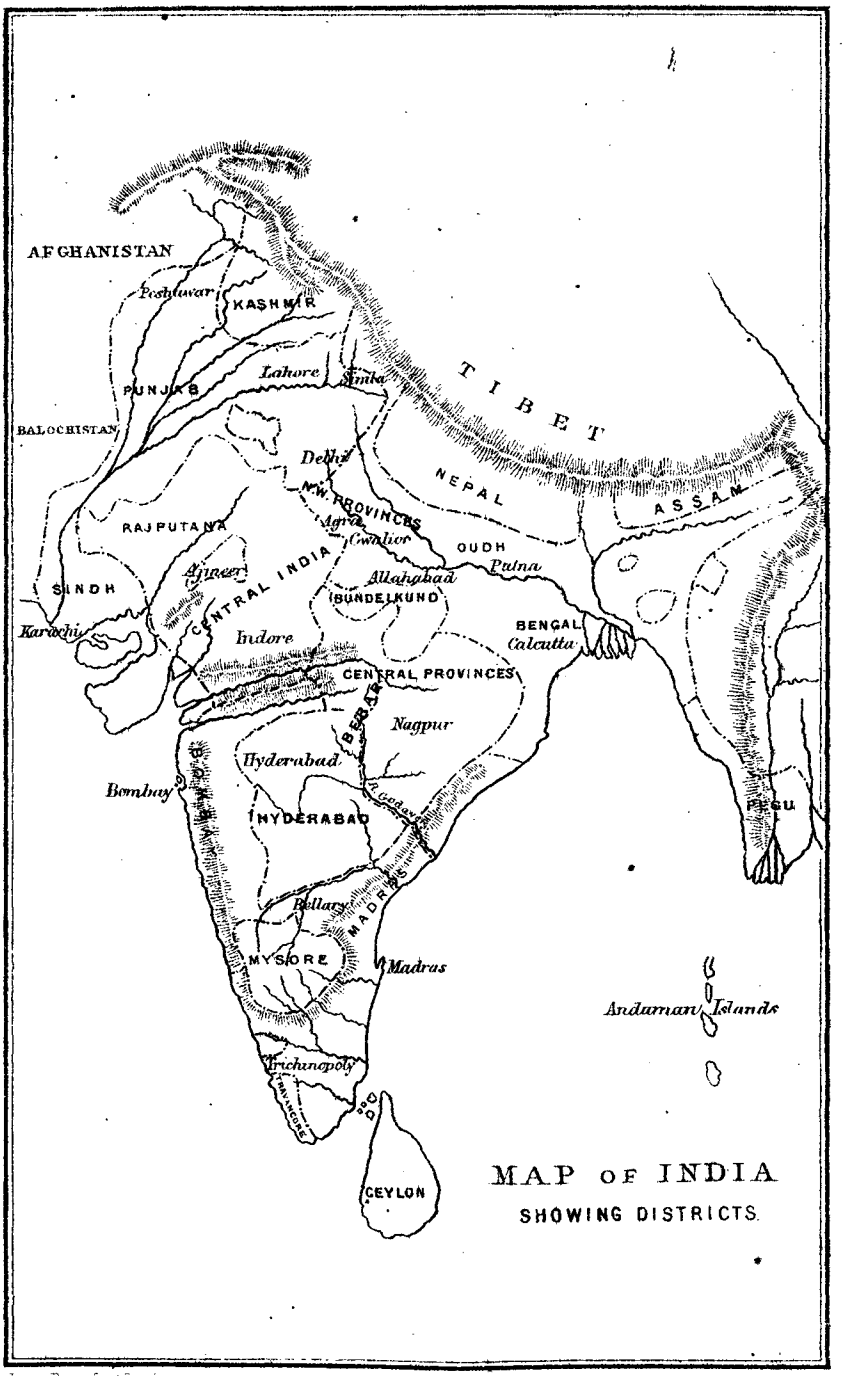
In the preceding pages I have given the history of cholera, together with the statistics of the mortality caused by that disease, and the statistics of the rainfall and of the food-supply, for each of the provinces of India separately for the several years for which the information is available. In this section I give the statistics of all the provinces combined, so as to show (1.) the annual prevalence of cholera among the civil population in each province, as gauged by the registered mortality, during the years for which the statistics are available, viz., 1865 to 1881 inclusive (Table No. I.); (2.) the monthly cholera mortality registered in all the provinces together among the civil populations (Table No. II.); (3.) the average monthly rainfall in all the provinces together (Table No. IIA.); and (4.) the total cholera death-rates among the troops and jail populations, and among the civil populations, in all the provinces together, with the total average rainfall by quarters and the total average price of the staple food-grains, for the whole series of twenty years from 1862 to 1881 inclusive (Table No. III.)

The tabular statements follow hereunder.

No. I.—STATEMENT *showing the Annual Total Deaths Registered from Cholera among the Civil Population in each of the Provinces of British India for the Years from* 1865 *to* 1881 *inclusive.*

Years.	ANNUAL TOTAL CHOLERA DEATHS IN THE PROVINCES OF								
	Madras.	Bombay.	Berar.	Central Provinces.	Bengal.	Assam.	Burma.	North-Western Provinces and Oudh.	Punjab.
1865	?	86,036	?	42,111	?	?	?	?	3,310
1866	200,961	23,037	?	4,531	No information.	No information.	?	?	1,051
1867	33,308	5,160	?	253			*297	56,367	43,146
1868	8,036	6,438	5,447	7,592			*191	20,910	532
1869	23,082	52,415	10,945	57,079			11,864	92,929	9,258
1870	55,867	2,666	504	107			2,383	28,441	469
1871	17,656	5,821	581	19	14,510	5,873	162	19,565	369
1872	13,262	15,642	1,578	1,592	37,536	8,225	640	77,131	8,727
1873	840	283	...	344	59,830	5,691	8,109	19,229	148
1874	313	37	2	14	†6,345	16,478	960	6,464	78
1875	94,546	47,555	22,465	14,643	†7,704	6,618	761	64,427	6,246
1876	148,193	32,117	2,683	20,124	†23,055	8,615	3,687	48,311	5,736
1877	357,430	57,252	842	3,418	155,305	11,377	7,276	31,770	29
1878	47,167	46,743	34,306	40,985	95,192	6,732	6,759	22,221	215
1879	13,296	6,937	223	27,575	136,363	17,415	1,828	35,892	26,135
1880	613	684	1	330	39,643	2,803	2,638	71,546	274
1881	9,446	16,694	3,404	9,140	79,180	5,010	5,239	25,864	5,207

* Cholera deaths in eighteen chief towns only. † Selected areas only (see history of these years).



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No. II.—STATEMENT *showing the Monthly Mortality registered from Cholera among the Civil Population in all the Provinces of British India for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	Cholera Deaths Registered in all the Provinces in the Months of												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	A year of general cholera activity throughout India.												
1863	A year of general cholera in Southern India; less active in Northern India.												
1864	Cholera prevalent all over India, but in declining severity.												
1865[1]	1,583	1,370	2,044	8,259	21,541	26,910	16,287	8,038	1,888	548	509	369	131,457
1866[2]	10,942	10,847	10,194	10,677	11,735	17,262	27,055	42,768	37,507	18,286	13,867	13,907	229,580
1867[3]	12,280	4,877	2,901	6,996	9,505	10,251	16,939	18,961	15,003	10,487	4,979	2,438	138,531
1868[4]	4,273	2,183	2,007	2,255	3,263	4,042	8,280	7,045	4,322	3,222	1,603	841	49,146
1869[5]	1,846	1,818	4,715	15,028	28,498	48,562	45,144	43,296	18,819	13,612	4,810	4,946	257,572
1870[6]	6,691	3,332	3,204	6,375	12,201	12,232	11,909	11,333	5,918	5,299	5,259	4,301	90,437
1871[7]	5,432	3,885	2,490	3,875	3,842	3,749	3,908	3,357	3,628	7,463	10,828	12,039	64,496
1872[8]	7,360	3,795	7,170	24,232	25,145	22,444	15,596	20,966	14,159	9,358	5,840	8,268	164,333
1873	5,291	4,821	7,520	11,757	10,801	10,663	12,725	13,305	8,064	3,033	2,442	4,052	94,474
1874[9]	893	803	979	1,456	3,641	4,726	3,323	2,390	2,803	4,228	3,284	2,165	30,691
1875[10]	235	583	2,662	16,785	19,063	30,375	46,330	41,978	34,187	25,404	20,767	19,978	264,965
1876[11]	17,259	14,652	16,395	24,301	32,146	44,037	41,549	27,012	15,679	8,959	13,487	37,045	292,521
1877	101,665	75,125	67,630	66,865	68,204	47,483	46,485	45,659	33,699	19,902	24,720	27,262	624,699
1878	14,992	8,096	17,898	32,365	35,404	42,117	47,637	43,122	22,191	10,326	10,071	16,101	300,320
1879	10,625	6,233	11,799	29,317	50,229	58,442	43,971	26,348	9,690	5,647	4,950	8,413	265,664
1880	5,307	4,795	6,878	27,830	16,647	11,209	7,963	16,401	5,273	4,844	4,821	6,564	118,532
1881	5,177	3,140	8,522	27,562	20,489	13,555	15,098	22,190	12,361	6,877	7,090	17,123	159,184
Totals[12]	20,959	15,082	17,976	30,528	32,383	31,243	28,878	26,875	15,139	8,618	9,177	15,603	252,466

[1] Cholera mortality of Bombay, Central Provinces, and Punjab only. [2] 1866.—Monthly mortality of Madras added. [3] 1867.—Monthly mortality of North-Western Provinces and annual total of chief towns of Burma, and of Oudh districts added. [4] 1868.—Berar monthly mortality added. [5] 1869.—All Burma annual total mortality added. [6] 1870.—Oudh monthly mortality added. [7] 1871.—Burma, Bengal, and Assam monthly mortality added. [8] 1872 and 1873.—Monthly mortality of all the provinces complete. [9] 1874, 1875, and 1876.—Bengal monthly mortality only for selected areas. [10] 1875.—The Assam monthly mortality is not included; the annual total is. [11] 1876 to 1881.—Monthly mortality of all the provinces complete. [12] The totals are of the complete returns of 1872 and 1873 and the years 1876 to 1881 inclusive, total eight years, to show the seasonal prevalence of cholera in India.

No. IIA.—STATEMENT *showing the Monthly Average Rainfall in Inches and Cents. for all the Provinces of British India for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	AVERAGE MONTHLY RAINFALL OF ALL THE PROVINCES IN INCHES AND CENTS.												Totals.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1862	0·40	0·78	1·39	3·03	4·04	12·53	15·73	13·40	9·60	5·39	0·47	0·06	66·82
1863	0·57	0·36	0·91	2·79	3·97	12·39	14·46	10·91	7·82	3·48	0·61	0·61	58·88
1864	0·31	0·93	0·80	2·34	3·73	9·09	13·03	10·67	6·49	2·62	1·11	0·40	51·52
1865	0·52	1·27	1·39	2·35	4·36	9·21	13·95	11·91	5·81	1·72	0·76	0·67	53·92
1866	0·67	1·00	0·70	1·78	2·47	8·65	13·35	11·57	5·75	3·32	0·48	0·77	50·51
1867	0·43	0·53	1·21	1·93	2·73	9·72	13·67	11·96	7·47	4·07	0·83	0·19	54·74
1868	1·13	1·15	0·92	2·19	2·29	11·28	12·24	9·58	6·64	1·32	0·42	0·17	49·33
1869	0·61	0·50	1·51	1·99	4·60	11·58	15·09	11·88	11·67	4·45	0·91	0·69	65·48
1870	0·55	0·35	1·17	1·60	4·23	13·10	16·73	11·84	9·15	5·19	0·84	0·21	64·97
1871	0·81	0·87	0·98	1·96	5·78	13·31	14·99	11·22	10·11	3·22	1·33	0·39	64·97
1872	0·62	0·49	0·94	2·37	4·35	11·75	16·84	13·09	10·98	3·90	1·24	0·70	67·27
1873	0·28	0·63	0·98	1·65	2·91	8·91	14·23	11·86	8·72	2·79	0·92	0·32	54·20
1874	0·54	0·94	1·17	1·90	6·24	11·87	14·80	12·34	9·69	4·67	0·71	0·17	65·04
1875	0·55	0·65	0·91	2·76	3·70	13·54	16·63	13·30	10·40	3·07	0·46	0·30	66·27
1876	0·17	0·23	1·28	1·68	4·32	10·07	16·42	11·05	8·05	2·61	0·92	0·12	56·92
1877	1·41	1·22	1·39	1·93	4·23	10·31	12·60	11·06	8·95	4·31	1·53	1·80	60·74
1878	0·54	0·78	0·74	2·36	4·37	9·79	14·69	16·69	10·76	4·41	1·25	0·43	66·81
1879	0·13	0·38	0·66	1·30	5·97	12·84	14·87	15·75	9·04	4·28	1·11	0·42	66·75
1880	0·32	0·96	1·93	2·71	3·79	12·69	14·84	10·40	9·00	3·44	2·04	0·64	62·76
1881	0·07	0·30	1·79	2·19	4·57	11·62	15·55	14·81	8·86	2·55	1·63	0·31	64·23
* Means	0·43	0·64	1·18	2·03	4·54	11·64	15·25	12·71	9·95	3·76	1·14	0·50	63·57

NOTE.—1862 is the rainfall of Assam, Bengal, Bombay, and Punjab only. In 1863 that of Madras and the Central Provinces is added, in 1864 that of the North-Western Provinces, in 1865 that of Berar, and in 1869 that of Burma and Oudh. From 1869 to 1881 the rainfall is complete for all the provinces.

* The *Means* are for the last thirteen years.

No. III.—STATEMENT *showing the Total Death-rates from Cholera among the Troops and Jail Populations, and among the Civil Populations, of all the Provinces of British India, together with the Total Average Rainfall and the Total Average Price of the Staple Food-grains, for the Twenty Years from* 1862 *to* 1881 *inclusive.*

Years.	Cholera Death-rate per Mille of Strength or Population.					Average Rainfall in Inches and Cents.					Average Price of Staple Food-grains in Sers and Cents. per Rupee.
	European Troops.	Native Troops.	Jail Populations.	Total of Troops and Jails.	Civil Populations.	Total of the Year.	Quarters.				
							First.	Second.	Third.	Fourth.	
1862	7·35	2·63	6·50	5·30	?	66·82	2·57	19·60	38·73	5·92	27·98
1863	3·21	1·69	15·81	6·44	?	58·88	1·84	19·15	33·19	4·70	25·16
1864	2·03	3·04	8·93	4·65	?	51·52	2·04	15·16	30·19	4·13	21·33
1865	4·92	5·45	8·64	6·30	3·19	53·92	3·18	15·92	31·67	3·15	17·11
1866	1·19	1·74	1·25	5·11	3·19	50·51	2·37	12·90	30·67	4·57	15·57
1867	9·73	1·84	3·78	4·40	1·34	54·74	2·17	14·38	33·10	5·09	19·22
1868	0·96	0·63	2·03	1·17	0·42	49·33	3·20	15·76	28·46	1·91	20·81
1869	1·16	4·37	6·00	6·69	2·15	65·48	2·62	18·17	38·64	6·05	15·48
1870	1·21	0·43	3·57	1·68	0·75	64·97	2·07	18·93	37·72	6·24	18·37
1871	1·11	0·32	0·89	0·70	0·35	64·97	2·66	21·05	36·32	4·94	23·52
1872	7·37	1·85	3·41	3·72	0·89	67·27	2·05	18·47	40·91	5·84	21·35
1873	0·76	0·37	3·32	1·55	0·51	54·20	1·89	13·47	34·81	4·03	21·31
1874	0·18	0·39	1·93	0·93	0·24	65·04	2·65	20·01	36·83	5·55	21·36
1875	3·46	1·67	2·32	2·32	2·10	66·27	2·11	20·00	40·33	3·83	24·52
1876	2·31	1·57	4·62	2·89	2·32	56·92	1·68	16·07	35·52	3·65	24·34
1877	0·91	1·35	8·54	3·99	3·39	60·74	4·02	16·47	32·61	7·64	17·00
1878	4·08	1·59	6·26	4·10	1·63	66·81	2·06	16·52	42·14	6·09	31·02
1879	5·57	1·69	1·01	3·09	1·44	66·75	1·17	20·11	39·66	5·81	14·16
1880	3·19	0·61	0·84	1·27	0·64	62·76	3·21	19·19	34·24	6·12	21·28
1881	2·61	1·04	3·59	2·29	0·86	64·23	2·16	18·36	39·22	4·49	23·83

NOTE.—Down to 1868 inclusive the rainfall is exclusive of Burma. For 1862 it is only for 4 provinces, for 1863 for 6, for 1864 for 7, and thereafter for all, except Burma until 1869, when the returns are complete for all the provinces.

These several tabular statements have been compiled from the statistics and records furnished at the commencement of each section dealing with the history of cholera in the several provinces of British India, and to be properly understood and intelligently appreciated for any truly practical purpose must be carefully studied in conjunction with the details embodied in the pages of the preceding history. In this place, for want of time, I can only attempt a most brief and cursory notice of the main features disclosed in respect to the deportment of the cholera of each successive year of the series as presented by the several provincial histories; and having done this, shall proceed to discuss the deductions drawn from the evidence recorded, with such explanation of the nature and causes of cholera as the information available enables me to offer, and to conclude with an expression of my views in respect to the treatment of the disease both preventively and curatively.

1862.—The only statistical information available in respect to the diffusion and prevalence of the cholera of this year is that afforded by the army and jail returns and records. From these it appears that the cholera of 1862 in India was widely diffused, and prevalent with greater or less severity of epidemic intensity throughout the extent of the southern peninsula, excepting only the Sind division of the Bombay Province, which remained exempt throughout, and to some extent also the western and northern districts of the Central Provinces; that it prevailed with more or less of epidemic activity over the greater portion of the Bengal and Assam Provinces and in the Pegu division of Burma; and, finally, that it was extensively and actively diffused over the greater portion of the territories of Northern India, being generally prevalent over the whole area of the North-Western Provinces and Oudh, widely epidemic in the Punjab, excepting the south-western districts bordering upon Sind, and also active in Central India and the eastern portions of Rajputana.

Nevertheless, on the whole, the cholera of 1862 appears to have been less intensely prevalent than that of the preceding year, in which there was much and widespread distress for food, especially in Northern India, owing to the high prices and famine rates ruling in many parts of the country; whereas in this year there was a marked improvement in the prices of the staple food-grains in all the provinces.

We thus find that the cholera of 1862 prevailed over the greater portion of the Indian continent, excepting in Sind and the adjacent desert regions of Rajputana and the South-Western Punjab, but with very varying degrees of intensity, as well as with very marked differences in the seasons of its prevalence in the several geographical divisions of its extensive territory, as is illustrated in the historical records of the several provinces. On the western coast of Bombay, on the Deccan tablelands, in the Central Provinces, in Central India and Rajputana, in the North-Western Provinces and Oudh, and in the Punjab the cholera of 1862 prevailed only as a single epidemic manifestation of the activity of the disease during the months from April to October inclusive. On the eastern coast of Madras and in its southern districts, in Bengal, in Assam, and to some extent in Burma also, the disease prevailed as a double epidemic—the first during the spring and early summer months, and the second during the autumn and early winter months—with a marked break in the continuity of epidemic activity between the two.

The provinces and regions affected by only the single epidemic of cholera are the same as those which are affected by only a single rainy monsoon, viz., that of the summer months—the south-west monsoon. The provinces and

regions affected by the double epidemic of cholera are the same as those which are affected also by a double rainy monsoon, viz., of the summer and winter seasons—the south-west monsoon and the north-east monsoon respectively. These phenomena of cholera prevalence in relation to the monsoon seasons are of more or less regularly recurring occurrence with each successive return of the monsoons, and vary only in different years and different parts according to variations in the force and distribution of the monsoon rains in successive years and successive cycles of years. These facts are very clearly established by the evidence produced in the pages of the preceding history; and whilst they positively confirm the belief very largely entertained in a direct and intimate relation and dependence between cholera prevalence and seasonal influence, they at the same time completely negative the notion entertained by some of a special endemic area—such as Bengal—whence, as from a centre, the disease periodically overflows the limits of its endemic area, and is conveyed by winds to other regions, in which, in the form of a germ endowed with vitality, it either bursts into activity or remains inert, according to the favouring or unfavouring conditions of the regions to which it is thus borne away. The advocates of this notion or theory of an air-borne cholera germ as the true cause of the production of the disease in its epidemic form in different parts of the country, assert that the necessary favouring conditions for the development of the activity of the germ outside its endemic area in Bengal—by its vitalisation from a state of dormancy—are the presence of a wind to carry the germ out of its perennial home or endemic area in Bengal, and the presence of moisture and warmth in the air of the region to which the germ is thus borne; that, in fact, moisture and warmth are the two conditions requisite for the vitalisation and activity of the cholera germs. But in this case there is no need to look for the presence of these assumed requisites within the area of any region or country so far as concerns its physical and climatic aspects, inasmuch as the assumed necessary favouring conditions of moisture and warmth are present in the air-passages of all mankind. And if there really be such a thing as a cholera germ which is borne by the air and rendered active so as to produce the cholera disease by vitalisation through the mere effects of moisture and warmth, it is difficult to understand the very partial distribution and strictly seasonal prevalence of the disease, although its varying degrees of incidence may be intelligibly explained by supposing that the healthy are capable of assimilating and disposing of the germs without inconvenience or injury, whilst the unhealthy would succumb more or less readily to their poisonous effects, admitting them to be possessed of such qualities.

As matters of fact, however, neither the existence of a central perennial home or endemic area of cholera specially limited to Bengal nor the existence of the cholera germ has yet been proved. The records and statistics of cholera in this country which we have brought together in the pages of the preceding history show that the endemicity or perennial prevalence of cholera is a mere matter of soil, climate, and population, and, in respect to the last, both as to density and prosperity. We find cholera endemic, or perennially present, in many other places besides Bengal, especially in parts of Madras and of the North-Western Provinces and Oudh; and we learn, from the evidence before us, that the disease year by year starts into its accustomed activity punctually all over India with the advent of the seasons favourable to its activity in them severally, and this quite independently of any connection with the prevalence or reverse of the disease within its endemic area in Bengal. In fact, in the southern peninsula generally, and

in Burma, the seasonal activity of cholera occurs during the prevalence of very strong winds blowing not from but towards the endemic area of Bengal, although in Burma and the eastern coast of Madras the second or autumnal and winter activity of the disease occurs during the prevalence of winds which blow from the direction of Bengal, viz., those of the north-east monsoon, which is merely a retrogression down the Bay of Bengal of the earlier south-west monsoon. These facts indicate the dependence of cholera prevalence upon the weather influences of these monsoons as monsoons, and quite independently of the direction from which they blow or the countries over which they sweep in their course.

In Bengal, viewed as an endemic area or perennial home of cholera, the prevalence of cholera is only apparently, and not really, greater than it is in other parts of the country in which the disease is more or less constantly present. The death-rates from cholera in this endemic area among the troops and jail populations, as well as among the general civil population within its limits, are not really greater than among the same classes in the other provinces of India either in ordinary or in epidemic years, if we take into consideration the distinguishing features of the country and the peculiar circumstances of its population. In the provinces of Bengal and Assam we have, relatively as well as absolutely, vastly greater areas than in any of the other provinces of India which by the natural conditions of their soil and climate favour the production of the weather influences which we are led to believe are the prime factors in the causation of the cholera disease. And in the areas characterised by these unenviable properties we have a population not only physically the most inferior of any in India, but also in point of prosperity and life-conditions—at least as regards the millions—the most poverty-stricken and ill-sheltered of any in this country. And, finally, we have this population much more densely crowded together than is the population of any other Indian province. The outcome of these facts is, that in the limited area under consideration we have a vastly greater number of subjects for cholera than we have in any other province of India, and with the natural consequence of a more constant occurrence of the disease. In some parts of the North-Western Provinces and Oudh, where the soil and climate assimilate somewhat to those of Bengal, and where the density of population also approaches that of the more southern province, but where the material prosperity of the people—the millions—is far superior, we also have a more or less well-pronounced endemicity of cholera, although with considerably less intensity of prevalence. In Burma, on the other hand, with a country the physical aspects and climate of which bear some strong points of resemblance to those of Bengal, we have a population singularly sparsely scattered over the general area, but at the same time more prosperous in their conditions of life than the population of most parts of India; and under these circumstances we find cholera seldom widely prevalent in this province except in seasons of its epidemic activity. We have made these brief observations in this place with the object of directing attention to the influences exercised upon the greater or less intensity of cholera prevalence in different seasons and different parts of the country by the conditions of the material prosperity of the populations as disclosed by the prices of the staple food, and by the conditions of the weather phenomena as indicated by the rainfall. A careful examination of the statistical statements given in the history of this and each succeeding year of our series will show how greatly the character of the ordinary seasonal manifestation of cholera activity is influenced for the better or for the worse by the conditions of food-supply and those of rainfall

obtaining. At the same time, it will be observed that the cholera disease has its special seasons of more active prevalence in each year, whether that prevalence be severely or mildly epidemic, and that these seasons, with slight modifications according to geographical and climatic region, are very much the same in all parts of India. Although the monthly rise and fall in the prevalence of the disease, especially in seasons of its epidemic severity, varies somewhat in the different provinces, still it will be observed, by comparing the monthly mortality among the civil populations for the successive years of our series, that the periods of the spring and autumn equinoxes are those at which cholera in India habitually sinks to a minimum of prevalence, and that the periods of the summer and winter solstices—the latter more especially within the limits of tropical India—are those at which the disease habitually rises to a maximum of prevalence. These latter periods, as compared with the former, in respect to their climatic features, are characterised by a markedly greater temperature of the air and an excessively greater rainfall—elements which combine to produce greater and more sudden changes in the meteorological phenomena of those periods—the latter more particularly in tropical India—than are observed to occur in the equinoctial periods. But besides these characteristic features of their weather phenomena, the solstitial periods—and, as regards the winter solstice, in tropical India more especially—are characterised by the greater activity of vegetable life and the maturity of the various fruits and grains which constitute a main part of the diet of the bulk of the populations. And this fact it is necessary to bear in mind, because, as we shall endeavour to show in a later passage, from the evidence of the records brought together in the preceding history of cholera in India during the past twenty years, there is no doubt that the disease, when naturally prevalent in the course of its periodical visitations, is very often more or less seriously aggravated by the injudicious consumption of the fruits and vegetables common to those seasons severally. For instance, in Northern India generally it has been observed that the eating of raw cucumbers, melons, &c., in the summer months, and of raw or uncooked maize cobs, carrots, &c., in the autumn or early winter months, is a very prolific source of the aggravation of the ordinary incidence of cholera; and this is no more than was to be expected, considering the natural properties of these vegetables as indigestible food with a tendency to purgative action upon the human system.

1863.—As in the preceding year, the army and jail returns and records furnish the only information, statistical and historical, which we possess regarding the cholera of 1863 in India. From these it appears that the disease was less widespread than that of the preceding year, but prevailed with greater intensity; that is to say, the cholera of 1863, while it manifested but little epidemic activity in Northern India, prevailed, generally with severe epidemic intensity, over the greater portion of the southern peninsula, as well as in the eastern provinces—Bengal, Assam, and Burma. As the first year of the triennial cycle 1863–65, the cholera of 1863 was due in the normal course as a cholera of maximum intensity in its cycle; and this, on the whole, it appears to have been, as will be seen in the sequel. The death-rate of the year among the troops and jail populations taken together was 6.44 per mille of strength against 5.30 in the preceding year. The increased prevalence of the cholera of 1863, as before stated, took place mostly in Southern India and in the eastern provinces, including Burma, and was in these extensive territories coincident with a marked rise in the prices of food over those obtaining in the preceding year; in the North-Western

Provinces and Oudh and in the Punjab, where the disease was by no means severely prevalent, the prices of food still continued fairly cheap, and in the Punjab were much cheaper than in 1862.

The rainfall of the year 1863 is not complete for all the provinces, but in those provinces for which the statistics are available the course of cholera prevalence would appear to have been in accordance with the relation to rainfall which has been many times illustrated in preceding passages. Thus in Madras the rainfall in January and February 1863 was much below average, that in March and April much above it (see Table No. IIA., Madras history section); in May it was considerably below average, in June slightly above, and in July much above average; in August and September it was again below average, in October but little above average, in November greatly below, and in December again much above average. The fluctuations and divergences from the normal monthly rainfall are, as we have seen, conditions favourable to the epidemic activity of cholera.

In Bombay the rainfall of the first five months of 1863 and the last month of 1862, taken together, was nearly one-third less than the average amount in those months; and in June this more or less severe and prolonged drought was followed by an unusually heavy rainfall (see Table No. IIA., Bombay history section), which in July was still above average, but in August fell much below it, and continued below average in September and October, and in November there was no rain at all. The heavy rain in June coming after the drought of the preceding six months, and the fluctuations in the succeeding months, were all circumstances favourable to the activity of epidemic cholera.

In the Central Provinces, excepting an excessive fall in March, a defect in July, and an excess in October (see Table No. IIA., Central Provinces history section), there was no great divergence from the average monthly rainfall. This seasonable distribution of the rainfall was unfavourable to the activity of epidemic cholera, and we find that, as such, cholera prevailed amongst the troops and jails mostly in the western and northern districts of the province, and only during the months from June to November inclusive, being, in fact, essentially a monsoon cholera.

In Bengal the rainfall of the first three months of 1863 and the last two months of 1862 (see Table No. IIA., Bengal history section) was uniformly much below the average. After this period of drought the fall in April was considerably above average, and that in May markedly below average; in June it varied little from the average, but in July fell below it; in the next three months the falls varied little from the average, but in October the fall was again below average, equal to average in November, and again below it in December. These fluctuations were favourable to cholera activity, and we find the disease prevailing with greater epidemic intensity than in the preceding year, in which the rainfall in the first six months diverged little from the average monthly falls.

In Assam the rainfall in the first four months of 1863 and the last two months of 1862 (see Table No. IIA., Assam history section) was uniformly greatly below the average, being nearly $7\frac{1}{2}$ inches in defect of the average fall for these six months; the fall in May was slightly above average, and it was followed by defective falls in June and July; the falls in August and September were above average, but in the next three months uniformly below average. The heavy rain in May after six months of preceding drought and the subsequent fluctuations of the rainfall were circumstances eminently favourable to the activity of cholera, and we find the disease pre-

vailing with considerable epidemic severity over the general area of the province.

For Burma and for the North-Western Provinces rainfall statistics for 1863 are wanting, but for the Punjab they are complete. In this province the rainfall in the first three months of 1863 varied little from the average amount for that period (see Table No. IIA., Punjab history section); in April and May, the latter especially, it was below average, but in June it was double the average fall for that month, and nearly as much in excess in July; in August also it was in excess; in September the fall was much less than half the average, and in October was again greatly above it. This peculiar distribution of the monthly rainfall was unfavourable to the epidemic activity of cholera, and the disease was in general abeyance in most parts of the province, although it showed some signs of activity in the extreme north-western districts bordering upon the Indus.

The cholera of 1863, in its distribution over the Indian continent, followed generally the course of its monsoon rain-currents—the south-west current in the summer months, and the north-east current for Southern India and Bengal in the autumn months. The severity of its epidemic prevalence was everywhere concurrent with high prices of food.

1864.—For this year also the only statistical information available regarding the course and prevalence of cholera in India is that afforded by the army and jail returns. From these it appears that the cholera of 1864, as was due in the normal course, was markedly less prevalent than that of the preceding year, although it still prevailed at a high degree of intensity over a large portion of the southern peninsula, where drought and famine caused severe distress among the poorer classes of the population.

In Madras the disease was actively prevalent during this year in, more or less, all parts of the province, but its incidence among the troops and jails was less than that of the cholera of the preceding year, the death-rate among these classes together being 4.68 per mille of strength in 1864 against 6.96 per mille in 1863. The cholera which broke out into fresh activity towards the latter part of 1863 continued to prevail with epidemic force during the earlier part of 1864. In March there was a check to the progress of the epidemic. In April this was overcome, and the disease again advanced in its hot-weather epidemic course, the climax being followed by subsidence to minimum prevalence in September. Finally, in October cholera renewed activity for an autumnal course. The rainfall in 1864 was characterised by an almost entire absence of rain in the first three months of the year, then by seasonable falls, much below the average, in April and May; these were followed by more than average falls in the next three months, and then by less than average falls in September and October; finally, the fall in November was above, and in December below, average.

In Bombay the cholera of 1864 was severely epidemic in most parts of the general area of the province, excepting the Sind division, which remained free of the disease throughout the year. Among the troops and jails the death-rate rose to 5.18 per mille of strength (inclusive of Native troops) against 0.61 per mille (exclusive of Native troops) in the preceding year. The disease appears to have acquired fresh activity in April, to have rapidly advanced to a climax in May and June, thereafter to have rapidly abated, and to have sunk to a minimum of prevalence in October. In November cholera renewed activity, and continued prevalent to the close of the year. During the last three months of 1863 and the first five months of 1864 the rainfall was almost uniformly below average. After this long period of

drought—the fall in April being greater than that in the preceding three months taken together, and that in May double the fall in April—the hot-weather monsoon rains set in in June with a considerably more than average downpour; the falls in the next four months were proportionally heavy, considering the previous drought, but they were all more or less below the average for these months. In November the fall was above average, and in December again below it. The course of the cholera was in conformity with the rainfall, as has been illustrated in preceding passages.

In the Central Provinces the cholera of 1864 was generally diffused over their whole area, and prevailed with considerable epidemic intensity, the seasonal course of the disease being much the same as that observed in the Bombay districts. The rainfall in the last month of 1863 and the first three months of 1864 was uniformly below the average, especially in February and March. In April the fall was above average, and in May excessively so. In June the fall was greatly in defect, being little more than half the average; in July also the fall was much in defect, but in August it more nearly approached the average. In the next two months the falls were again greatly below average; finally, the fall in November was above the average, and in December below it.

In Bengal the cholera of 1864 was as widely diffused as in the preceding year, but it prevailed with lesser intensity, though its seasonal activity was much the same, in point of time, in both years. The death-rate among the troops and jails fell to 9.36 per mille of strength in 1864 from 14.09 per mille in 1863. The rainfall during the first three months of the year varied little from the average, but in April was much in defect. During the succeeding months up to September inclusive the falls varied little from the average, the divergence usually being in the direction of defect. In October the fall was in excess, and again less so in November; but in December it was in defect. There were no violent alternations in the monthly rainfall during this year.

In Assam also the cholera of 1864, though as widely diffused, prevailed with lesser intensity than in the preceding year. The death-rate among the troops and jails was 4.72 per mille of strength against 9.37 per mille in 1863. The rainfall of the year, which was greatly below average in the last three months of 1863, was again in defect in January 1864, but in February the fall was double the average for that month. In March it was much below average, in April about average. In May and June the falls were below, but in July much above, the average. In August they were slightly and in September considerably below average, and in the next three months uniformily a little above average. With the exception of the heavy fall in February after four months of drought, and the defective fall in March, there were no violent fluctuations in the monthly rainfall of this year. For the seasonal prevalence of cholera see the history for this year in the Assam Province section.

In Burma the cholera of 1864 was generally prevalent in the Pegu division and in the adjoining districts of Tenasserim, but in abating force as compared with the cholera of 1863. The Arakan division appears to have remained exempt throughout the year. The death-rate among the troops and jails in this year was much the same as that of the preceding year.

In the North-Western Provinces and Oudh the cholera of 1864 was as widely diffused as that of the year before, but its intensity of prevalence was less. The death-rate among the troops and jails was 3.53 per mille against 8.92 per mille in 1863.

In the Punjab, excepting some unimportant local manifestations of activity in the central districts of the province, the cholera of 1864 was generally in abeyance everywhere. The rainfall of the year diverged little from the average during January and February, but was greatly in defect in March. The fall in April, however, was as greatly in excess of the average; that of May also was very much in excess; in June it was less than half the average, and in July also was much in defect. In August it was above average, and in the next two months somewhat below it; in November there was no rain, and the fall in December was much above average. The monthly distribution of the rainfall was unfavourable to the activity of epidemic cholera.

According to the normal cyclic course of the disease, the cholera of 1864 was due as a cholera of abating prevalence in relation to that of the preceding year; and this appears to have been the case everywhere in India, except in the southern peninsula, where it prevailed with an intensity equal to, if not greater than, that of the year before. This severe intensity was coincident with the widespread prevalence of drought and abnormal rainfall, together with famine distress, in that part of the country.

1865.—In this year, for the first time, the registration of deaths among the civil populations was initiated, and took effect partially in two or three of the provincial areas. As a result of this measure, greater attention than heretofore was paid to the prevalence of cholera, and the appearance of the disease was more fully reported than in previous years. Consequently the returns represent the disease as greatly more prevalent in this year than in either of the preceding years of the series dealt with in this inquiry; whereas, in the normal order, the cholera of 1865, being in the last year of its cyclic course, was due as a cholera of minimum prevalence. Notwithstanding all this, however, there is sufficient evidence to show that the cholera of this year was, out of the ordinary course, a cholera of exceptionally great and widespread activity over the greater portion of the Indian continent. Among the troops and jails the total cholera death-rate in 1865 was 8.30 per mille of strength against 4.65 in the year before, and 8.44 per mille in 1863. The returns for 1864 and 1865 are complete for all the provinces, but those for 1863 are defective, the returns for the Native troops in Bombay Province, and Central India and Rajputana, and those for the jails in Burma, being wanting. As the cholera of 1863 was a great cholera, and was severely prevalent in all those territories, it is probable that the actual mortality from the disease among the troops and jail populations was considerably greater than is shown by the returns which are available, and that it equalled, if it did not exceed, the cholera mortality among them recorded in 1865. In this case, taking the incidence of the disease among the troops and jails as a guide, we may consider the cholera of 1863 to have been the appearance of the periodical cholera epidemic, in maximum intensity in the first year of its cycle, and that of 1864 to have been the abating epidemic, in the second year of its cycle, and that of 1865 to have been, contrary to the ordinary subsidence in the third year of its cycle, a cholera of irregularly severe epidemic intensity.

In Madras the cholera of 1865 was widely diffused and severely prevalent. The death-rate among the troops and jails was 6.56 per mille against 4.68 in the preceding year. This increased mortality was coincident with a marked rise in the prices of food. The rainfall in the last month of 1864 and the first three months of 1865 was almost uniformly much below average; that in April and May was in great excess of the average, and that

in June markedly below it. In July it was a little above the average, and in August again below it considerably; in October the defect was still greater, and in the last two months was also markedly below the average. This distribution of the seasonal rainfall was favourable to the activity of epidemic cholera, coupled as it was with distress for food.

In Bombay the mortality returns of the civil population, which are for the first time available in this year, give a cholera death-rate of 7.51 per mille of population. Among the troops and jails the death-rate was 7.93 per mille of strength against 5.18 per mille in 1864. The prices of food were still at famine rates, though somewhat improved upon those of the preceding year. The rainfall of the year was uniformly in excess of the average during the first five months, but in June it was greatly in defect, as also in July; in August the fall was nearly double the average, but in September it again fell much below it. In the next three months the falls deviated little from the average, and usually in the direction of excess. The cholera mortality (see Tables Nos. II. and IIA., Bombay history section) commenced with increased epidemic activity in April, and made very rapid advances in May and June; in July it commenced to abate, and with the heavy rain in August rapidly subsided; in September there was still some activity, and thereafter the disease steadily declined to minimum prevalence in December.

In the Central Provinces the cholera of 1865 was virulently prevalent all over their general area, the death-rate among the civil population being estimated at 10.40 per mille. Among the troops and jails the death-rate was 19.67 per mille of strength against 13.87 in the year before. This severe prevalence of cholera was coincident with sore famine distress. The rainfall of the year was greatly in excess of the average during the first three months, especially in February; in the next two months it was markedly in defect, as also in June, when the monsoon rains set in with somewhat less than the average downpour. In July the fall varied little from the average, but both in August and September the falls were greatly below average. In the other three months of the year the falls did not much vary from the average. These fluctuations in the seasonal rainfall were favourable to the activity of epidemic cholera, combined with the pressure of famine distress.

In Berar also, although no statistics are producible, the cholera of 1865 prevailed with severe epidemic intensity. Famine pressed sorely in this province also, the rates of the staple food-grain being somewhat higher than in the adjoining Central Provinces. The rainfall was exceptionally in excess of the average in March, and this was followed by a slightly less than average fall in April, and a more marked defect in the fall of May. In June the monsoon rains set in with a more than average fall, and the falls in the next two months were increasingly above the average. In September the fall was greatly below the average, and in October also the defect was very marked; in the last two months the falls were also markedly below the average. These alternations in the seasonal rainfall were favourable to the activity of epidemic cholera.

In Bengal the cholera of 1865 was severely epidemic over some extensive areas in which famine distress pressed hardly. The death-rate among the troops and jails was 9.36 per mille of strength against 6.97 in the year before. The rainfall of the year presented great and successive fluctuations in the monthly falls (see Table No. IIA., Bengal history section); thus in February the rainfall was greatly above the average, in March less so, in April

again greatly so, and in May excessively so. In June the fall was below, and in July much above, the average; in August the fall was greatly in defect, in September less so, and in October again greatly so; the fall in November was also much in defect, that in December was in excess. These alternations in the monthly rainfall were favourable to the activity of epidemic cholera.

In Assam the cholera of 1865 prevailed with much severity, and this was accompanied by widespread famine distress. The death-rate among the troops and jails was 20.80 per mille of strength against 4.72 per mille in the year before; and this increase was equally incident among both the troops and the prisoners—all Natives. The rainfall in January and February was markedly below average, in March the defect was extraordinarily great (see Table No. IIA., Assam history section), by more than 3 inches; in April the fall was again in defect, but to a less extent, and in May it was in excess by nearly 3 inches; in June the excess was still greater, and in July was extraordinarily so, by no less than 12.88 inches. In August the fall was less than half that in July, and was also nearly 2 inches below the average; in September the defect was very great, by 7.37 inches; in October it was less so, but still very marked; in November the fall was slightly below the average, in December considerably above it. All these irregularities in the seasonal rainfall were eminently favourable to the activity of epidemic cholera.

In Burma the cholera of 1865 was more widely diffused and more severely prevalent than that of 1864; the death-rate among the troops and jails was 6.36 per mille of strength against 4.82 in the year before.

In Central India and Rajputana the cholera death-rate of 1865 among the troops, both European and Native, was 7.70 per mille of strength against 2.93 per mille in 1864, thus indicating a generally increased prevalence of cholera during this year in that part of the country also.

In the North-Western Provinces and Oudh the cholera of 1865 was widely diffused, and in some parts prevailed epidemically, but, on the whole, the intensity of the disease was less than in the preceding year. The death-rate among the troops and jails was 2.71 per mille of strength against 3.53 in 1864. Food was dear in this year, but there was no approach to famine distress in the provinces generally.

In the Punjab the statistics of cholera mortality among the civil population are available for the first time in this year, and give a death-rate of 0.22 per mille of population. Among the troops and jails the death-rate was 0.13 per mille of strength against 0.06 per mille in 1864. Food was dear, but there was no general distress from high prices. The rainfall in the first three months of the year was altogether greatly in excess of the average; in April, also, the fall was above the average, but in May it was below it, and in June very greatly so; in July, also, the defect was very great, the fall being less than half the average; but in August it was above the average, and in September very much so, the fall being nearly double the average; in the next two months the fall was below average, but in December extraordinarily above it. These peculiar distributions of the seasonal rainfall were unfavourable to the activity of epidemic cholera.

From the foregoing details we find that the cholera of 1865, contrary to the ordinary course, was a cholera of increased instead of decreased severity. This increase was generally distributed over all the provinces of India, but was more marked in some than in others, and was everywhere attended by a general rise in the prices of food, the rise being more marked in some pro-

vinces than in others, the incidence of cholera prevalence and that of high prices for food being coincident in these provinces.

1866.—The statistics of the cholera of this year are still very imperfect for the civil populations of the several provinces, and our main knowledge of its general incidence is derived, as in the previous years, from the army and jail statistics of the disease. From these it appears that the cholera of 1866 was somewhat less prevalent among those classes of the population than that of the preceding year, the death-rate being 5.11 per mille of strength against 6.30 in 1865. But, at the same time, the high figure shows that the cholera of 1866 was a cholera of great epidemic activity, as was due in the normal course for this the first year of the new triennial cycle 1866–68; and it will be seen in the sequel that it was a cholera of maximum intensity in this cycle, so far as is shown by the statistics of the incidence of the disease among the troops and jails in all India. Among the civil populations of the several provinces also, so far as our imperfect statistics indicate, the cholera of 1866 appears to have been a great cholera over India generally, though presenting a very marked subsidence in some provinces from the activity of its prevalence in the preceding year. The cholera of 1866 may, in fact, be considered as the appearance of the regular periodically recurring cyclic cholera epidemic; it was accompanied in this year by high prices or famine rates for food in nearly all parts of India, excepting the Punjab. The rainfall of the year was very unevenly distributed, being generally much less than that of the preceding year, except in Madras, Bombay, and the Central Provinces, in each of which it was somewhat more.

In Madras the statistics of cholera mortality among the civil population are for the first time available in this year, and they give a death-rate of 8.94 per mille; the death-rate among the troops and jails was 8.85 per mille of strength against 6.56 in 1865. The year was one of even sorer distress for food than the preceding. The rainfall, as to quantity, was somewhat more than that of the preceding year, but the difference as to seasonal distribution was very great in the two years, whilst in both the total amount was considerably below the average. During the first six months of 1866 the rainfall was uniformly below the average, and most markedly so in May and June. In July the fall was little less than the average, but very greatly in excess of that of the preceding month, with which, in the normal course, it should have been nearly equal. In August and September the falls were also, and more markedly, below average, but in October the fall was unusually heavy, being more than 3 inches above the average. In November the fall was considerably in defect, and in December it was quite extraordinarily in excess. The cholera mortality (see Tables Nos. II and IIA., Madras history section) was very active in January, during the first drying up of the copious rainfall in the preceding two months, and continued with gradually declining prevalence through the succeeding months of defective rainfall until May. In June, with the first falls of the monsoon rains (greatly in defect), cholera burst out with revived and greatly increased epidemic activity; the heavier fall in July aided this activity, since it was less than the average, and insufficient to saturate soil and air with moisture, and thus check the evaporation that was freely going on; the falls in August and September, also in defect, added fresh material for more rapid evaporation, greater in August than in September, and cholera increased more in the former and less in the latter month. In October, with diminishing temperature, there occurred an unusually heavy rainfall, enough to quench the previous free play of evaporation, and with this change cholera activity sud-

denly abated, the mortality of the month being less than half that of the preceding. In November, with a diminished rainfall, cholera continued abating, but in December an unusually heavy rainfall stirred cholera into fresh activity.

In Bombay the cholera of 1866 was decidedly less prevalent than that of the preceding year. Among the civil population the death-rate was 1.85 per mille against 7.51 in 1865, and among the troops and jails it was 0.65 per mille of strength against 7.93 respectively. Though they still continued high, there was a marked fall in the prices of food during this year. The rainfall of the year was less than that of the preceding, and was also below the average; its monthly distribution, too, differed greatly from that of the rainfall in 1865. During the first five months of this year the rainfall was uniformly and greatly in defect, in June the monsoon rains set in with a defective fall by 2 inches, in July the fall was about as much in excess of average, and in August the excess was by about 3 inches. In September the fall was greatly in defect, by 3½ inches, but in October it was again much in excess, and in the last two months greatly in defect. The cholera activity of the year followed the course of the rainfall in respect to the effects of the latter upon the soil (see Tables Nos. II. and IIA., Bombay history section). Thus with the commencing drought in February cholera began increased activity, and this continued progressively during the succeeding months of drought till the climax was attained in May. The monsoon rains of June sufficed to quench the parched soil and check the rapidity of evaporation, and at the same time cholera began to abate. The heavy rainfall in July further checked evaporation, and with this cholera still further abated; but the lighter fall in August again gave play to evaporation, and with this change the abating cholera renewed activity. In September, with a defective rainfall and diminishing temperature, there was still some free evaporation going on, and cholera, though abating, still continued active. In October a more than average rainfall, with a rapidly diminishing temperature, very considerably checked evaporation, and with this cholera rapidly subsided. The trivial showers in November and absence of rain in December afforded, under the low temperature of the season, little or no material for evaporation, and cholera quickly sank to minimum prevalence.

In the Central Provinces also the returns show a marked abatement in the cholera activity of 1866, as compared with the prevalence of the disease in the preceding year, both among the troops and jails and among the civil population. The death-rate among the former was 6.98 per mille of strength against 19.67 in 1865, and among the latter 0.60 per mille against 10.4, respectively. Food in this year was at famine rates, and prices much higher than in the year before. The rainfall, though still much below the average, was more than that of 1865, but its monthly distribution differed greatly in the two years. In the first five months of 1866 the rainfall was alternately below and above average, but with no very marked deviation from the ordinary quantity. In June the monsoon set in with a marked defect in the fall for that month, but it was followed by more than average falls in the next two months. During the remaining months of the year the falls were uniformly below average, and without great deviations from the ordinary quantities. Thus throughout the year there were no violent contrasts of drought and rainfall or rainfall and drought—a condition of affairs quite unfavourable to the epidemic activity of cholera, notwithstanding the presence of famine to aggravate the severity of an epidemic if produced.

In Berar the cholera of 1866 is said to have been prevalent in both

divisions of the province, but there are no statistics to show its intensity. The prices of food ranged still higher than in the preceding year, and approached famine rates. The year was one of severe drought, the rainfall being more than 10 inches below the average, and about 11 inches less than that of the preceding year; but there were no violent contrasts in the departure from the ordinary quantities due in each month, except in September, when the temperature had already turned to fall towards the close of the year.

In Bengal the cholera of 1866 was severely epidemic, and with far greater fatality than that of the preceding year, especially in the wide areas afflicted by famine. Among the troops and jails the death-rate was 20.96 per mille of strength against 6.97 in 1865; this increased death-rate was mainly caused by excessively high mortality among the jail populations. The rainfall of the year was much the same in quantity as that of the preceding, and also much about the average, but there were marked differences in its monthly distribution in the two years. In January and February the falls were above the average, in March below, in April above, and in May again below it. In June the fall was slightly above the average, but in July markedly below it; in the next two months also the falls were distinctly below average, but in October above, and in the last two months again below average. The alternate fluctuations were favourable to the activity of epidemic cholera.

In Assam, though the cholera of 1866 was actively prevalent throughout the province, it appears to have been less fatal than that of the preceding year. The death-rate among the troops and jails was only 2.86 per mille of strength against 20.80 in 1865. Food was at famine rates throughout the year. The rainfall was greatly less than that of the preceding year, and also less than the average, and its monthly distribution differed remarkably in the two years (see Table No. IIA., Assam history section). In the last month of 1865 and the two first of 1866 the rainfall was uniformly much in excess of the average; in the next three months it was in defect, but the defect was proportionally not so great as in the preceding four months was the excess. In the next three months again the falls were in defect, but the deviations from the average were not very great, and nothing in comparison with the deviations in the same three months of the preceding year. In October the fall was markedly above the average, and in the next two months below it. But nowhere throughout the year was there any violent contrast of deviations from the ordinary course, such as characterised the rainfall of 1865. The monthly distribution of the rainfall in 1866 was unfavourable to the activity of epidemic cholera.

In Burma the cholera of 1866 appears to have been less prevalent than that of the preceding year. The death-rate among the troops and jails was 3.29 per mille of strength against 6.36 in 1865.

In Central India and Rajputana also the cholera of 1866 appears to have been less prevalent than that of the preceding year. The death-rate among the troops stationed in these territories was 0.19 per mille of strength against 7.70 in 1865.

In the North-Western Provinces and Oudh a similar abatement in the prevalence of cholera in 1866 is indicated by the army and jail returns. The death-rate among these classes was 0.81 per mille of strength against 2.71 in 1865. The prices of food were much the same in both years. The rainfall statistics are not complete for the whole provinces, the returns for Oudh being wanting.

In the Punjab a like decline in the prevalence of cholera in 1866 is exhibited by the returns, both for the troops and jails and for the civil population. The death-rate among the latter was 0.06 per mille against 0.22 in 1865; among the former it was a blank against 0.13 per mille of strength respectively. There was an improvement in the prices of food in 1866, and rates were comparatively cheap. The rainfall of the year was greatly less than that of the preceding, and was also below the average; its monthly distribution also differed greatly from that of the rainfall in 1865. The rainfall in the last month of 1865 and in the first month of 1866 was largely in excess of the average; in February the fall was in defect, in March more markedly so, in April less so, and in May again more markedly so. In the next two months it varied little from the average, but in August was in excess. In September it was full 2 inches in defect, and in great defect in the next three months also, the last two being rainless. The cholera of the year, which was active in January, abated in February, renewed activity in March, increased in April, and remained stationary during the next three months; in August it began to decline, remained stationary in September, abated in October, and finally renewed fresh activity during November and December.

On the whole, the returns show that the cholera of 1866 prevailed with more or less epidemic severity in all Southern and Eastern India, and but mildly in Northern India. The provinces most severely affected were those in which famine distress was also most pressing, and in which the rainfall deviated most widely from its average seasonal course.

1867.—As in the preceding year so in this cholera varied greatly in the degree of its prevalence in the different provinces, but, taking them all together, the prevalence of the cholera of 1867 in India generally was, as was due in the normal cyclic course of the periodically recurring cholera epidemic, a cholera of abating prevalence. This is shown by the death-rates of the provinces for which we have the statistics of cholera mortality among the civil population, as well as by those for the troops and jails. In the latter classes of the general population the total death-rate for 1867 was 4.40 per mille of strength against 5.11 in the preceding year. But taking the several provinces separately, we find the death-rates more or less greatly reduced in all Southern India and in Burma, and more or less greatly increased in all Northern India, whilst Bengal and Assam occupy an intermediate place, the death-rate having fallen in the former and risen in the latter. Apart from any consideration of the character of the rainfall, this distribution of cholera prevalence was coincident with a steady fall in the prices of food in Southern India and their steady rise in Northern India, whilst in Bengal and Assam, although prices had fallen in both, the fall was much greater in the former than in the latter.

In Madras the cholera death-rate among the troops and jails was 0.82 per mille of strength in 1867 against 8.85 in 1866; amongst the civil population it was 1.40 per mille against 8.94, respectively. The rainfall of the year 1867 was very much less than that of the preceding year, which itself was below the average, and it was much less divergent from the normal course also (see Tables Nos. II. and IIA. Madras history section). The rainfall in January and February, following an excessive fall in the preceding December, was much below the average in both months; in March it was less so, and in April again more greatly in defect. In May the fall was still much in defect, and in June also, but in the next four months it varied little from the average in any one of them; in November and December, however, the falls were very greatly in defect. With this distribution of the rainfall

the cholera of the year was in close accord. Thus the abating cholera of the preceding year's epidemic continued active in January during the drying up after the preceding month's heavy rainfall; in February, with light showers, it greatly abated, and then, with the deficient falls in March and April, abated still further. In May, with a markedly defective rainfall, cholera abated yet more; but in June, with the heavier falls of the commencing monsoon, though they were greatly in defect, cholera recommenced fresh activity, and this was continued at a moderate increase during the heavier falls of the next two months. In September the fall appears to have saturated the soil, which had now received three months of fully average rainfall, and cholera abated markedly. In October, with another month of average rainfall, cholera rapidly subsided, but in November, with a very great defect in the rainfall, the subsidence of cholera was suddenly arrested, and the disease was slightly more fatal than in the preceding month; in December again, with a continuous defect in the rainfall, after the previous full supplies, cholera continued with increasing activity. The contrasts in the deviations of the rainfall from the normal course were neither sudden nor great, and so, too, in the course of the cholera activity there were no sudden nor great alternations of increase and decrease.

In Bombay the cholera death-rate of 1867 among the troops and jails was only 0.11 per mille of strength against 0.65 in 1866; among the civil population it was 0.39 per mille against 1.85, respectively. The rainfall of the year was less than that of the preceding, and also more below the average. Its distribution in the first five months of the year varied little from that of the rainfall in the same months of the preceding year, but it followed two months of preceding drought at the close of 1866, whereas the early rainfall of 1866 followed three months of fully average and more than average rainfall at the close of 1865, this last circumstance being a condition favourable to more free evaporation in the early half of 1866 than was the case with respect to the early half of 1867. And this explains the difference in the activity of cholera during the early half of the two years compared. The rainfall in June 1867 was seasonable, and comparatively little below the average, but with its advent cholera began to increase, and, with a fall in July still below average, continued to increase, but very slowly. In August, however, with the first fall in the year which was above average, there took place a very marked increase in the activity of cholera, and with the defective rainfall in the next month this activity was continued, though with much abatement. The excessive rainfall in October checked both evaporation and cholera activity, and the fully average fall in November maintained these conditions, cholera rapidly subsiding. The drought in December, however, again gave play to evaporation, and therewith cholera started into fresh activity.

In the Central Provinces the cholera death-rate among the troops and jails was a blank in 1867 against 6.98 per mille of strength in the preceding year; among the civil population it was only 0.03 per mille against 0.60, respectively. The rainfall of the year was 16 inches more than that of the preceding, and 11½ inches in excess of the average. The excess was proportionally distributed between the several months from March to October inclusive, the month of May alone showing a slight defect. In the two first and two last months of the year, all cold-weather months, the rainfall was much in defect. This distribution of the rainfall supersaturated the soil and air with moisture during the hot months, and reduced evaporation to a minimum of activity; it produced a state of affairs altogether unfavourable to

the epidemic activity of cholera in this year, but it prepared the soil for free evaporation in the next year, provided its rainfall should be in defect. And, as we shall see later on, this was actually the case; a defective rainfall in 1868 gave free play to a very unusually rapid evaporation from a previously well-soaked soil, and cholera flourished with epidemic force.

In Bengal the cholera death-rate among the troops and jails was only 7.51 per mille of strength in 1867 against 20.96 in 1866. Among the civil population, too, though no statistics are producible, the disease, it appears, was considerably less prevalent in this than in the preceding year. There was a very marked improvement in the price of the staple food-grains in 1868, and rice became comparatively cheap. The rainfall of the year was in excess of that of the preceding, and also of the average, by about 2¼ inches. Its distribution varied little from the normal monthly averages.

In Assam the cholera death-rate of 1867 among the troops and jails was 6.54 per mille of strength against 2.86 in the preceding year. The price of food was markedly cheaper in this year than in 1866. But the rainfall was very deficient, and presented violent fluctuations of deviation from the average monthly supplies, conditions favourable to the activity of epidemic cholera, though probably to a limited extent, since the defect in 1867 followed a more serious defect in the previous year (see Table No. IIA., Assam history section).

In Burma the cholera death-rate of 1867 among the troops and jails was 0.78 per mille of strength against 3.29 in 1866. A corresponding decline in the prevalence of the disease, it appears, took place among the civil population of the province also, since cholera is recorded as prevalent only in the Pegu division in this year, whilst in the preceding it prevailed in Arakan as well as in Pegu.

In Central India and Rajputana the cholera death-rate of 1867 among the troops stationed in these territories was 5.86 per mille of strength against only 0.19 in 1866, thus indicating a considerably increased prevalence of cholera in these parts of Northern India during 1867.

In the North-Western Provinces and Oudh also there was a marked rise in the prevalence of cholera in this year. Among the troops and jails the death-rate was 5.22 per mille of strength against 0.81 in 1866. Among the civil population the cholera of 1867 prevailed as a great epidemic, and gave a death-rate of 1.92 per mille, but there are no statistics to show whether this rate is an increase over that of the preceding year among this class of the general population. Food was cheaper in this than in the preceding year, and more so in Oudh than in the North-Western Provinces.

In the Punjab the cholera death-rate in 1867 among the troops and jails was 8.89 per mille of strength against no mortality at all from the disease in 1866; among the civil population, also, the cholera of 1867 prevailed as a great epidemic, and gave a death-rate of 2.45 per mille against 0.06 in 1866. High prices for food prevailed generally in 1867, and in the eastern districts touched famine rates in many parts. The rainfall of the year was less than that of the preceding, which itself was much below average; but its distinguishing feature was its very irregular seasonal distribution. Thus, after marked drought in the last four months of 1866, the rainfall in the first three months of 1867 continued in great defect. In April, after this long drought, the fall was in excess by one-third of the average; in May the fall was fully double the average; in June it was greatly below the average; in July, also, it was markedly below average; in August it was much above the average, and in September below it by about a half; in the next two months

the falls were greatly below average, and in December less so. The cholera prevalence of the year was in strict relation with the rainfall. Thus (see Tables Nos. II. and IIA., Punjab history section) the increased activity of cholera in January, which took place under light showers after two preceding months of no rainfall, was checked by the heavier showers in February. The defective fall in March, with increasing temperature, encouraged freer evaporation, and cholera immediately commenced activity. In April a fall above average added fresh material for more rapid evaporation from a parched soil under increasing temperature, and cholera burst out in epidemic activity. A heavier fall in May failed to saturate the parched soil, and cholera advanced with doubled activity. A very defective fall in June gave free play to evaporation from the soil damped by the previous heavy fall, and cholera continued increasingly active; again a deficient fall in July, and cholera maintained the activity acquired in the preceding month. In August came a heavy fall, markedly in excess of the average, evaporation was checked, and cholera commenced to abate. In September a defective fall and diminished temperature kept up the check upon evaporation, and cholera continued abating. In the next three months successive defective falls and rapidly diminishing temperature allowed of no fresh renewal of evaporation activity, and cholera continued steadily subsiding, and finally sank to a minimum prevalence in December.

1868.—The cholera of 1868 in India was a cholera of minimum prevalence in its cycle. The periodical cholera epidemic which commenced in 1866 had run its course and terminated in this year. The death-rate for the troops and jails was 1.17 per mille of strength in 1868 against 4.40 in 1867, and 5.11 in 1866. For the civil population the statistics are not complete for the three years, but, such as they are, they show a similar steady yearly decline of cholera in the successive years of the cycle. The mild prevalence of the cholera of 1868 was coincident with cheap prices of food in all the provinces excepting the Punjab.

The highest death-rates among the troops and jails occurred in the Central Provinces, Bengal, and Assam; and among the civil population in the Central Provinces and Berar. For Bengal and Assam statistics are not available, but it is known that in both provinces the cholera of this year, though widely diffused, prevailed with no great severity among the civil population. The cholera of 1868 sank to minimum prevalence in Southern India, abated markedly in Northern India, continued in considerable activity in Bengal and Assam, and revived afresh in epidemic force in the Central Provinces, as compared with its course in the preceding year.

In Madras the cholera death-rate of 1868 was, among the troops and jails, 0.26 per mille of strength against 0.82 in 1867; among the civil population it was 0.36 per mille against 1.49, respectively. This decline in cholera was coincident with a very marked fall in the prices of the staple food-grains, and food was unusually cheap.

In 1868 the rainfall was much greater than that in 1867, but it was still less than the average, and was distributed in a manner very different from that of the preceding year. After two months of extraordinary defect at the close of 1867, the rainfall in January 1868 was in extraordinary excess; this was followed by defective falls in each of the next four months, and then came an excessively heavy fall in June—a fall nearly double the average for this month. The fall in July was also above the average, but that of August was below it by nearly one-half. In September again the fall was below the average, and in the next three months also very much so. The

cholera of the year was in due relation to this distribution of the rainfall (see Tables No. II. and IIA., Madras history section). Thus the cholera which renewed activity at the close of 1867 was greatly increased at the opening of 1868 under the heavy rainfall then following upon two preceding months of drought; with the light falls in the next two months and the drying-up of the rain in January cholera, though much abated from the intensity acquired in January, continued very active, but manifestly declining; under the heavier showers of April and May the disease continued steadily declining; with the excessive fall in June the decline of cholera was more marked, but with the lesser fall in July there was a slight renewal of cholera activity. This, however, was only temporary, and probably altogether local, the rainfall of the month being considerably above the average, and, following upon the excessive fall in June, quite sufficient to complete the saturation of soil and air with moisture, and thus reduce evaporation to within very narrow limits. The falls in the succeeding five months were uniformly below average in greater or less degree, and without alterations in the monthly falls; so that the check to unusual activity of evaporation produced by the excessive rainfalls in June and July was not disturbed during the subsequent months, in which also the temperature was steadily declining. Under these conditions cholera continued steadily declining month by month until December, when, with the drought of that month, it renewed activity.

In Bombay the cholera death-rate among the troops and jails was 0.73 per mille of strength in 1868 against 0.11 in 1867; among the civil population it was 0.50 per mille against 0.39, respectively. Food in this year was generally somewhat cheaper than in the preceding. The rainfall was somewhat more than that of 1867, but was still less than the average. Its seasonal distribution varied little from the ordinary, except in the monsoon months (see Tables Nos. II. and IIA., Bombay history section). The cholera of the year prevailed in relation with the rainfall. After the revived activity of cholera during the drought in December 1867 the disease abated in January, and continued more or less stationary during the next three months, which were characterised, together with January, by seasonable showers, alternately below and above average, but diverging little from it. With the more frequent showers in May cholera commenced increased activity; this, however, was checked in June by the heavy and over-average rainfall of that month; but in July, with a fall somewhat under average, the disease started forward with increased activity. The excessive fall in August, still the hottest period of the year, did not check the increasing activity of cholera, whilst the very greatly defective fall in September, by favouring evaporation from the previously well-damped soil, afforded encouragement to cholera activity, and the disease at once assumed considerable epidemic intensity. The continued defect of rainfall in the succeeding months aided the drying up of the previous heavy rains, and the epidemic flourished till November, finally abating with the trivial showers and fall of temperature in December.

In the Central Provinces the cholera death-rate in 1868 among the troops and jails was 3.67 per mille of strength against no mortality in 1867; among the civil population it was 2.18 per mille against 0.03, respectively. The price of food was still high, and much the same as in 1867. The rainfall of the year was very greatly in defect, being 28.43 inches less than that of the preceding year, and 16.86 inches below the average. Its monthly distribution, also, was marked by some striking irregularities, such as excessive fall in January, drought in April and May, defective falls, more or less serious, in the next four months, and drought again in the last three months.

During the first three months of the year cholera manifested no epidemic activity, but with the drying up in April the disease commenced to increase, and with the light showers in May made a marked advance. In June, with a defective monsoon rainfall upon a thirsty soil, cholera assumed epidemic proportions (see Tables Nos. II. and IIA., Central Provinces history section), and, with the continued greatly defective falls in the next two months of high temperature, culminated in July, and maintained epidemic intensity in August. In September and the succeeding months to the end of the year, with diminishing temperature and uniformly defective rainfall, cholera abated, and steadily and rapidly subsided.

In Bengal the cholera death-rate among the troops and jails was 5.91 per mille of strength in 1868 against 7.51 in 1867. Among the civil population also cholera was apparently less prevalent in this than in the preceding year. There was a marked improvement in the prices of the staple food-grain in this year. The rainfall of the year, though above average, was somewhat less than that of 1867, and it was characterised by several considerable alternations in the monthly falls, which tended to the production of conditions favourable to the activity of cholera.

In Assam the cholera death-rate of 1868 among the troops and jails was 1.42 per mille of strength against 6.54 in 1867. Apparently a similar abatement of the disease took place among the civil population also in this year. Rice, the staple food-grain, was considerably cheaper in this than in the preceding year. The rainfall of the year was very abundant, being 14.71 inches more than that of 1867, and 4 inches above the average. The excess fell almost entirely in the four months of June to September. In the preceding five months there were considerable contrasts in the successive monthly rainfalls, conditions favourable to cholera activity. In the last three months the falls were uniformly in defect.

In Burma the cholera death-rate of 1868 among the troops and jails was 0.74 per mille of strength against 0.78 in 1867. Among the civil population also the disease was in weak prevalence in this year, as it was in the preceding.

In Central India and Rajputana the cholera death-rate of 1868 among the troops stationed in these territories was only 0.75 per mille of strength against 5.86 in 1867. This very marked decline in the incidence of the disease among the troops in this part of India, coupled with a similarly marked decline in the death-rates among the troops and jails in the North-Western Provinces and Oudh and in the Punjab, indicates a very distinct subsidence in the activity of cholera in Northern India generally during 1868.

In the North-Western Provinces and Oudh the cholera death-rate of 1868 among the troops and jails was only 0.51 per mille of strength against 5.22 in 1867; among the civil population it was 0.51 per mille against 1.92, respectively. The price of food was still high, that of wheat being much the same as in the preceding year. The rainfall of the year in the North-Western Provinces was greatly in defect, being about 26 inches less than that in the preceding year; the falls in the first four months of 1868 were uniformly very much in excess of the average, the falls in the next two less so, and those in the other six months were uniformly in defect. This distribution of the rainfall, by preventing drought in the early half of the year, was unfavourable to the epidemic activity of cholera.

In the Punjab there was no mortality from cholera among the troops and jails in 1868, the death-rate among these classes in 1867 being 8.89 per mille of strength; among the civil population the death-rate was only 0.03 per mille against 2.45 in 1867. There was a great rise in the prices of food

in this year, wheat being 3½ sers the rupee dearer than in the preceding year. The rainfall of the year was continuously in defect since 1865, and was nearly 6½ inches below the average. The falls in the first four months were uniformly above average, those in the other eight months uniformly below it. There was no drought in the early part of the year, and there was no alternation of excess and defect in the monthly falls throughout the year. The conditions were unfavourable to the epidemic activity of cholera, and there was none. The disease, however, as it prevailed, was regulated in its fluctuations by the rainfall (see Tables Nos. II. and IIA., Punjab history section).

1869.—In this year, the first of the next triennial cycle 1869–71, the recurring periodical cholera epidemic made its appearance in the normal course, and cholera in India started into a fresh career of epidemic activity. The total death-rate of the year among the troops and jails was 6.69 per mille of strength against 1.17 in 1868. For the civil populations the statistics are not complete, but, so far as they go, they show a very marked revival of cholera activity in this year, more especially in the provinces of Southern India. The returns for the troops and jails show a very marked increase in the death-rates of all the provinces, especially Burma, the Central Provinces, the North-Western Provinces and Oudh, and the Punjab. Similarly, the returns for the civil populations show a marked increase in the prevalence of the disease during 1869 in all the provinces, but least so in Madras and the Punjab, and most so in the Central Provinces, Berar, Bombay, Burma, and the North-Western Provinces and Oudh. For Bengal and Assam statistics are wanting, but even in these provinces cholera is known to have prevailed with much greater severity in this than in the preceding year. This great increase in the prevalence of cholera in 1869 was coincident with a great rise in the price of the staple food-grain in all the provinces, excepting Madras and Bengal (for Burma no statistics on this point are available), whilst in the Central Provinces, Bombay, Assam, and the Punjab the prices approached famine rates. In the Punjab the incidence of the cholera of 1869 among the troops and jails was out of all proportion severer than among the civil population, and this greater mortality among the former classes was due entirely to excessive death-rates among the troops, both European and Native. The rainfall of the year (see Table No. IIA. at the head of this section) was greatly in excess of that of the preceding, and was also above average. Its seasonal distribution was also very different from that of the rainfall in 1868. The rainfall of the first three months of 1869 varied little from the average, but it followed a period of very marked drought during the last three months of 1868. The fall in March was above average, that in April below it; the falls in the next three months were singularly close to the average in each, but the fall in August was distinctly below it, that of September above it, and that of October also; in November the fall was below average, and in December it was again above it. In comparing the course of the cholera of the year (see Table No. II. at the head of this section) with this distribution of the rainfall, we find the disease increasingly active under the light showers of the early months of 1869, after the drought of the later months of 1868, and bursting into epidemic prevalence in April with the increasing heat and light rainfall of that month. With the more copious, but still average, falls of the next three months the epidemic flourished with intensity. With the defective fall in August the abatement of cholera, which had commenced in July, made little progress; but in September, with an excessive rainfall and diminishing temperature, which checked evaporation, the abatement of cholera was sudden and very great.

In October, with a rainfall again in excess and a falling temperature, the abatement of cholera continued but slowly. In November, with defective rainfall and the setting in of the cold weather, cholera suddenly subsided, but with the light showers in December showed a tendency to renew activity.

Following the course of the disease in the several provinces separately, we find a corresponding sequence of events with regard to cholera in its relation to the rainfall.

In Madras the death-rate among the troops and jails was 2.21 per mille of strength in 1869 against 0.26 in 1868; among the civil population it was 0.87 per mille against 0.36, respectively. The price of food was dearer in this than in the preceding year, but not much so. The rainfall of the year was more than that of the preceding, but hardly differed from the average. During the first four months of 1869 (see Tables Nos. II. and IIA., Madras history section) the rainfalls varied little from the average, but they followed upon five months of uniform and great defect in the latter half of 1868. The fall in May 1869 was much below average, that in June equal to average, and that in July much above average. In August the fall was equal to average, but in September again much above it; in October it fell much below, and in November again rose above average, and in December was still in excess of average. The cholera of the year, under the light showers of the first four months, after the preceding five months of drought, prevailed with steadily increasing but mild activity. With the light fall in May the disease still maintained the mild activity of the preceding months; but in June, with the first falls, in average supply, of the monsoon rains, cholera suddenly acquired epidemic intensity, and continued to flourish with the succeeding alternations of heavy and light monthly falls to the close of the year.

In Bombay the death-rate among the troops and jails was 2.33 per mille of strength in 1869 against 0.73 in 1868; among the civil population it was 0.87 per mille against 0.36, respectively. Food in this year was much dearer than in the preceding. The rainfall of the year was very abundant, being nearly 10 inches in excess of the average, and nearly 11 inches more than that of the preceding year. The falls in the first three months of 1869 were uniformly above the average, and came after a period of four months of severe preceding drought; with this disposition of the rainfall the epidemic cholera of the preceding year, which had commenced to subside in December, suddenly renewed epidemic activity in January 1869, and with the more than average light showers of the next two months, and March especially, maintained the acquired activity, increasing distinctly with the unusually heavy fall in March (see Tables Nos. II. and IIA., Bombay history section). In April the rainfall was only one-third the average supply, that of the preceding month being three times greater than its average; and with this drought and increasing temperature after the preceding copious fall for this season cholera burst out into greatly increased epidemic activity. The fall in May was one-third above the average, and falling upon a thirsty soil, gave rise to a more free and rapid evaporation under the increasing temperature of that month, and cholera advanced greatly in epidemic intensity. The first falls of the monsoon rains in June were below average, and failed to quench the parched soil, from which evaporation still continued active, and cholera maintained its acquired epidemic intensity. In July the rainfall was considerably above average, but it failed to saturate soil and air with moisture, and evaporation continuing freely active under the high temperature of this month, cholera still maintained its acquired epidemic intensity in full force. In August the rainfall was again above the average, and this following upon

the heavy fall of the preceding month, and attended by a diminished temperature, sufficed to quench the thirst of the soil and to check evaporation; with this change of conditions cholera suddenly ceased its epidemic activity, and abated greatly from the intensity attained in the preceding month. In September the rainfall was not far short of double the average supply; the result was to confirm the newly established change of conditions, and cholera continued abating. In October a very light fall, but still well above average, followed, and allowed of some drying up of the previous exceptionally heavy fall; with this temporary renewal of evaporation activity the abatement of cholera was checked, and the disease increased somewhat over the prevalence of the previous month. In November and December the falls were above average, and cholera again abated and rapidly subsided.

In the Central Provinces the cholera death-rate of 1869 among the troops and jails was 12.16 per mille of strength against 3.67 in 1868; among the civil population it was 8.30 per mille against 2.18, respectively. Food in this year was at famine prices. The rainfall of the year was very abundant, being $1\frac{1}{10}$ inches above the average, and 18 inches more than that of the preceding year. Its monthly distribution differed greatly from that of the rainfall in 1868, and presented great alternations of heavy and light falls during the year. After more distinctly marked drought in the last three months of 1868 (see Tables Nos. II. and IIA.; Central Provinces history section), the year 1869 commenced with continued great defect of rainfall in January and February. The epidemic cholera of the preceding year, which had entirely subsided and sunk to a few deaths in December, recommenced activity in January 1869 with the trivial showers in that month, and increased sensibly in February with more rain. In March, with a fall much above average, cholera made decided progress; but in April, with a fall less than half the average and a great increase of temperature, giving free play to evaporation of the previous copious falls, the disease suddenly broke into epidemic activity. In May another defective fall, of little more than one-third the average supply, and a growingly hot temperature favoured more free and active evaporation, and cholera advanced greatly in epidemic activity. In June again a defective fall of little over half the average supply afforded fresh material for increased evaporation at the hottest period of the year, and cholera at once, with the greater rainfall drying up as it fell, bounded up to a great height of epidemic intensity. The heavy and above-average rainfall in July quenched the parched soil and considerably reduced the activity of evaporation; and in response cholera at once ceased advance, and very greatly abated from the degree of activity previously attained. In August and September two more heavy rainfalls, each well above average, followed, and with the lessening temperature, confirmed the check previously imposed upon evaporation, and cholera continued rapidly abating. In October again a heavy rainfall, of more than double the average supply, intensified the previously established conditions, and cholera sank to a low level of activity. In November there was next to no rain, and in December the fall was fully treble the average, but at this cold season the previously soaked soil was insensible to such slight changes, and the subsiding course of cholera continued unchecked.

In Bengal the cholera death-rate of 1869 among the troops and jails was 7.85 per mille of strength against 5.91 in 1868; among the civil population there are no statistics to show the death-rate, but the disease is known to have prevailed among them with greatly increased severity in this year than in the preceding, especially in the tracts pressed by famine distress. Food

in 1869 was generally dearer than in the year before, and in some parts the prices were at famine rates. The rainfall of the year was less than that of the preceding, and it was also less than the average. After three months of marked drought at the close of 1868, the falls in January and February 1869 were still below average. The fall in March was above average; in April and May the falls were below it; in June the fall was above, in July below, in August also below, and in September again above average; in October it was about average, and in the last two months much below average. These alternations of greater and lesser falls following after a period of preceding drought were favourable to the activity of epidemic cholera.

In Assam the death-rate among the troops and jails was 11.66 per mille of strength in 1869 against only 1.42 in 1868; among the civil population also the cholera of this year is known to have been much more severely prevalent than that of the preceding. There was severe famine distress during 1869 in most parts of the province. The rainfall of the year was very abundant, and in fact excessive; it was 10½ inches more than that of the preceding year, and 14½ inches above the average. After three months of defective falls at the close of 1868, the year 1869 opened with unusually heavy falls in excess of average in January and February; in the next month the fall was much below average, but in April it was above it; in May the fall was excessively above the normally high average of this month, but in June it was much below it; in July the fall was again above average, in August it was equal to average, in September again above it, and in October also, but less so; in November the fall was nearly equal to average, in December greatly below it. These great and successive fluctuations above and below average, commencing after a period of drought, were eminently favourable to the activity of epidemic cholera, and its fatality was probably greatly aggravated by the existent famine.

In Burma the death-rate of 1869 among the troops and jails was 7.26 per mille of strength against 0.74 in 1868; among the civil population also the cholera of 1869 was greatly more prevalent than that of the year before, though the statistics of the latter are too imperfect to admit of comparison. The rainfall of the year was above the average, and was most irregularly distributed over the several months, presenting successive contrasts of excess and defect productive of conditions favourable to the epidemic activity of cholera.

In Central India and Rajputana the cholera death-rate of 1869 among the troops in these states was 7.54 per mille of strength against only 0.75 in 1868. This increased mortality, coupled with a corresponding increase in the death-rates among the troops and jails in the North-Western Provinces and Oudh and in the Punjab, indicates a marked revival of epidemic cholera activity over Northern India generally in this year.

In the North-Western Provinces and Oudh the death-rate of 1869 among the troops and jails was 7.24 per mille of strength against only 0.51 in 1868; among the civil population it was 2.28 per mille against 0.51, respectively. Food during this year was at famine rates; the price of wheat was about 7 sers the rupee dearer than in the preceding year, 1868. The rainfall statistics are, for the first time, complete in this year for the combined provinces, and they show a total average rainfall in 1869 somewhat distinctly below the average. Its monthly distribution was very irregular, and caused divergences from the normal course productive of conditions favourable to the epidemic activity of cholera. Thus (see Tables Nos. II. and IIA., North-Western Provinces history section), after five months of very

marked drought in the latter half of 1868, the falls in the first two months of 1869 were still below average, but with less divergence from the normal supply. The more frequent showers in January, following upon the great drought of the three preceding months, gave rise to freer evaporation, and with this the epidemic cholera of the preceding year, which was rapidly subsiding at its close, renewed fresh activity. The lighter falls in February, encouraging evaporation, kept up this activity, though at a sensibly declining rate. The heavier falls in March, more than double the average for that month, with the growing temperature, gave a fresh impetus to evaporation from a thirsty soil, and in response cholera started into active epidemic prevalence. The almost entire absence of rain in April, with a great increment of advancing temperature, afforded free play to the drying up of the heavy rainfall in March, and concurrently cholera made great advance in epidemic activity. In May, with a trivial rainfall little more than that of April, the previous conditions were kept up, and cholera continued its epidemic activity with increasing force. In June came the first falls of the monsoon rains, but they fell short by about two-thirds of the average supply, and only served to intensify rapid evaporation from a parched soil in the hottest month of the year; with this intensification of the previously established conditions cholera prevailed with doubled epidemic activity. In July the rainfall was more abundant, but it was still nearly 3 inches below average, and did not suffice to quench the thirsty soil, and cholera continued to increase, though at a checked rate, indicating an impeded evaporation by the greater rainfall of the month. In August the fall was again greatly in defect, by $3\frac{1}{2}$ inches, or one-third of the average supply, and thus, with the yet high temperature of the season, gave freer play to evaporation from a moistened but not saturated soil; and with these conditions cholera advanced with freer strides, and quickly attained the climax of its epidemic intensity. In September the previously established and steadily maintained conditions, since March, were abruptly changed; the rainfall in this month, of much diminished temperature, was extraordinarily abundant, and almost fully 4 inches in excess of average; it saturated the soil and greatly checked the previous free evaporation; with the establishment of this change cholera immediately ceased epidemic activity, and abated with a rapidity accordant with the suddenness of the change in the conditions above described. In October again the rainfall was exceptionally in excess of the average, by nearly three-fourths of the usual supply, and still further repressed the activity of evaporation, and cholera continued abating. In November there was no rainfall to stimulate fresh evaporation, and cholera rapidly declined. In December the fall was treble the average amount, but, with the low temperature of the season and a satiated soil, caused no change in the course of evaporation, and cholera continued subsiding unchecked.

In the Punjab the cholera death-rate of 1869 among the troops and jails was 9.77 per mille of strength against a blank in 1868; among the civil population it was 0.53 per mille against 0.03, respectively. There was a still greater rise in the prices of food in this year; the price of wheat was $4\frac{1}{2}$ sers the rupee dearer than in 1868. The rainfall of the year, though fully equal to average, was 7 inches more than that of the preceding year, and was very irregularly distributed over the year, producing contrasts of excess and defect favourable to cholera activity. Thus (see Tables Nos. II. and IIA., Punjab history section), after very marked drought in the last four months of 1868, the rainfall in January 1869 was above average by nearly one-third; this, following upon the slightly defective fall in the preceding December, caused a

slight check to evaporation, and cholera showed no signs of increasing activity. In February the fall was less than average by two-thirds, and this defect set free evaporation, with the commencement of which cholera also began to stir into activity. In March the rainfall was excessive, not far short of four times the average supply, and it, notwithstanding the increasing temperature, much impeded evaporation; and with this the commencing activity of cholera made slow progress. In April the fall was greatly in defect, less than one-fourth of the average quantity, and allowed of the resumption of freer evaporation; but this was not so active as it might have been, owing to the reduction of temperature caused by the excessive rainfall in the preceding month, and hence cholera continued to advance but slowly. In May there was only 0.04 inch of rain against 1.02 inches, the average fall in this month; this defect, with the recovery of seasonal high temperature, gave a great impetus to evaporation from a rapidly drying-up soil, and in response cholera doubled its previous activity. In June the rainfall was again in defect by one-third the average amount, and added only fresh material for a continuance of evaporation, and with this cholera continued increasing, but at a gentle rate. In July the monsoon rains gave a more than average supply, and this, falling upon a thirsty soil, greatly increased the amount of evaporation; with this cholera made a distinct advance towards epidemic activity. In August the rainfall was in great defect, only half the average quantity, and this, with the high temperature of the season, set free evaporation at a very greatly increased rapidity; cholera immediately responded by a great rise in epidemic activity. In September the rainfall was greatly in excess, by more than double the average, and served to check the previous free evaporation; with this change cholera ceased to increase, and commenced to abate. In October the fall, though well above average, was so light as to allow of free play to the drying up of the previous heavy rainfall, and cholera, arrested in its commenced abatement, increased perceptibly in activity. In November there was no rain, and in December less than a third of the average fall; so that, with the diminished temperature of the season, there was no further excitement of evaporation, but rather its steady cessation; with these conditions cholera ceased epidemic activity, and rapidly subsided.

1870.—The cholera of this year, as due in the normal course for the second year of the cycle, was a cholera of abating prevalence. The death-rate among the troops and jails was 1.68 per mille of strength against 6.69 in 1869; among the civil population (the statistics for Bengal and Assam are wanting for both years) it was 0.75 per mille against 2.15, respectively. Among the civil populations the death-rates show a marked decline in all the provinces for which we have the statistics, excepting Madras, in which the death-rate was higher in this than in the preceding year. In Bengal cholera appears to have prevailed with equal severity in both years, but in Assam it abated very distinctly in this year. In Central India and Rajputana the disease seems to have subsided into complete abeyance. This abatement of cholera in 1870 in India generally was coincident with a marked improvement in the prices of food in all the provinces. The rainfall of the year, though varying in the different provinces more or less greatly, was on the whole somewhat less than that of 1869, but still above the average. Its monthly distribution is shown in Table No. IIA. at the head of this section, and that of cholera mortality in Table No. II. Comparing these together, we find that in the first three months of 1870 the monthly rainfall varied little from the average, and that cholera, after some increased activity in January, abated greatly during February and March. In April the fall was

considerably in defect, and cholera resumed activity. In May again the fall was below average, and cholera greatly increased. In June the fall was much above average, and cholera ceased increasing. In July again the fall was above average, and cholera began to abate. In August the fall was below average, and the abatement of cholera was arrested. In September the fall varied little from the average, but still in the direction of defect, and the abatement of cholera was resumed with rapidity. In October the fall was much above average, and again the abatement of cholera was arrested. In November and December the falls were below average, and cholera very slowly again began to abate.

In Madras alone, of all the provinces, does the cholera of 1870 show signs of revived epidemic activity. The death-rate among the troops and jails was 1.12 per mille of strength against 2.21 in 1869, but among the civil population it was 2.32 per mille against 0.87, respectively. Food, though still dear, was cheaper than in the preceding year. The rainfall of the year was 3 inches more than that of the preceding, in which it was equal to average. The fall in January was very greatly above the average (see Tables No. II. and IIA., Madras history section), and with it there was a temporary increase of cholera; in February there was hardly any rainfall, and cholera greatly abated; in March the fall was below average, and cholera continued slowly abating; in April again the fall was much below average, and the increasing temperature began to tell upon the thirsty soil, evaporation became freer, and cholera recommenced increasing activity. In May again the fall was greatly in defect, and encouraged more rapid evaporation; cholera at the same time doubled its activity. In June the fall was fully up to average, but it fell on a thirsty soil, and greatly increased evaporation, and cholera again doubled its previously acquired activity. In July the fall fell short of the average, and failed to saturate the soil and check the rapidity of evaporation, and cholera increasing attained its climax. In August the fall was above average, and at last began to saturate both soil and air with moisture, and thus check evaporation to some extent; with this change cholera ceased to increase, and began slowly to abate. In September the fall was again above average, and more so than in the preceding month; it still further impeded evaporation, and cholera greatly abated. In October the fall was again above average, and excessively so, and cholera continued to abate. In November the fall was below average, and cholera continued to abate, but very slowly. In December again the fall was in defect, and this two months' defect encouraging drying up of the previously soaked soil, cholera again renewed activity.

In Bombay the death-rate among the troops and jails in 1870 was 0.05 per mille of strength against 2.33 in 1869; among the civil population it was 0.20 per mille against 3.78, respectively. Food was still dear, but somewhat cheaper than in the preceding year. The rainfall of the year was more than 8 inches less than that of the preceding, but was still somewhat above the average. After the uniformly excess falls in the last six months of 1869, the falls in the first five months of 1870 diverged but little from the average, and usually in the direction of defect; there was no drought, and no violent contrast in the falls of the successive months—nothing to disturb the ordinary course of seasonable rainfall on a satiated soil. In June and July the monsoon rainfalls were successively much above the average, and at once saturated a previously satiated soil and effectually restrained undue evaporation. During these seven months cholera was very mildly prevalent, with varying fluctuations in relation with the successive monthly rainfalls (see

Tables Nos. II. and IIA., Bombay history section); but in August, with the first great defect in rainfall, the disease was stirred into some slight activity. The drying up, which commenced with this defect, was not stopped by the fall in September, which again was in defect, and cholera increased in activity. In October the fall was greatly in excess of average, and cholera continued increasing; but in November the fall was greatly in defect, and allowed the heavy fall of the preceding month to dry up unhindered, and with this cholera made a great advance in activity. In December, with a trivial fall and the decline of temperature, cholera ceased to increase, and began to abate rapidly.

In the Central Provinces the death-rate among the troops and jails was 0.11 per mille of strength in 1870 against 12.16 in 1869; among the civil population it was 0.01 per mille against 8.30, respectively. Food was still dear, but much less so than in the preceding year. The rainfall was somewhat more than that of the preceding year, and also above average. After the excess falls in the last six months of 1869, the rainfall in the first seven months of 1870 was also almost uniformly in excess of average, the only exceptions being in February and in May, in each of which the defect was great, but altogether insufficient to produce drought in a thoroughly satiated soil. In August and September (see Tables Nos. II. and IIA., Central Provinces history section) again the falls were in defect, but not to so great an extent as to produce any great drying up of the previous heavy falls. In the next two months the falls were again greatly in excess of average, and December was rainless. This distribution of the monthly rainfall in 1870, coupled with that of the rainfall in the latter half of 1869, was altogether adverse to the activity of unusual evaporation, and with the absence of such evaporation there was no unusual cholera.

In Berar the cholera death-rate of 1870 among the civil population was 0.24 per mille against 5.20 in 1869. Food was much cheaper in this than in the preceding year. The rainfall of the year was 11¼ inches more than that of the preceding, and 12¼ inches above the average. After an excessively abundant supply during the last five months of 1869, the rainfall of 1870 in this province followed a seasonal course closely agreeing with that above described for the Central Provinces. In neither province was there any drought followed by rainfall, and in neither was there any unusual cholera, excepting a very trivial increase of its activity during the monsoon rains in Berar. The fall here in July was excessively high, more than 2⅔ times in excess of the average, and with it there was a sudden appearance of some little cholera activity; the falls in the next two months were both below average, and cholera maintained this low activity; but this ceased with the excessive fall in October, and the disease very quickly subsided.

In Bengal the death-rate of 1870 among the troops and jails was 7.71 per mille of strength against 7.85 in 1869. Among the civil population also the cholera of this year prevailed with considerable epidemic severity, but there are no statistics to show whether it exceeded that of the preceding year. There was a sensible improvement in the prices of food during this year, and rice was cheaper by about 2½ sers the rupee. The rainfall of the year, whilst somewhat more than that of the preceding, varied slightly only below the average. The falls during the last two months of 1869 and the first five of 1870 were uniformly more or less considerably below average; in the next four months the falls varied little from the average, being alternately somewhat above and below it; in October the fall was greatly in excess of average, in November slightly so, and in December there was no rain at all. The long drought in the early part of the year, followed

by the seasonable monsoon rains in alternating excess and defect, and then by drought at the close of the year, presents conditions favourable to the epidemic activity of cholera.

In Assam the death-rate of 1870 among the troops and jails was 1.99 per mille of strength against 11.66 in 1869. Among the civil population also the cholera of this year appears to have been less prevalent than that of the preceding. There was a great improvement in the prices of food as compared with the famine rates of the year before, and rice was cheaper by about $6\frac{1}{4}$ sers the rupee. The rainfall of the year, though fully equal to average, was quite 14 inches less than that of 1869. After the heavy rains in the preceding year, the falls in the first four months of 1870 were uniformly much below average, excepting in February and May, in which months they were nearly equal to average. In June the fall was excessive, and it was followed by defective falls in the next two months, then again by excessive falls in the two months succeeding, and finally by defective falls in last two months. This distribution of the monthly rainfall was favourable to cholera activity, and had it been preceded by long drought instead of by superabundant rainfall, as was actually the case, the mild cholera of the year, it may be safely said, would have been replaced by a severe epidemic of the disease.

In Burma the death-rate of 1870 among the troops and jails was 10.47 per mille of strength against 7.26 in 1869; among the civil population it was only 0.96 per mille against 4.01, respectively. The rainfall of the year was 4 inches less than that of 1869, and it was also nearly $2\frac{1}{2}$ inches less than the average. After more or less great and uniform defect in the last six months of the preceding year, the falls in the first five months of 1870 were uniformly in excess of average, except in March, when the fall was only half the average supply. In June the fall was $7\frac{1}{5}$ inches below average, and in July it was $3\frac{1}{2}$ inches above, but in all the succeeding months the falls were uniformly below average. The distribution of the monthly rainfall in the earlier half of the year, following the drought in the latter half of 1869, was favourable to epidemic cholera activity, but that of the latter half was unfavourable (see Table No. IIA., Burma history section, and history of 1870).

In Central India and Rajputana there was no cholera mortality among the troops there in 1870; the death-rate among them in 1869 was 7.54 per mille of strength. This immunity, coupled with the fall in the death-rates in the North-Western Provinces and Oudh and in the Punjab, indicates a marked subsidence of cholera activity in Northern India generally during 1870.

In the North-Western Provinces and Oudh the death-rate of 1870 among the troops and jails was only 0.93 per mille of strength against 7.24 in 1869; among the civil population it was 0.70 per mille against 2.28, respectively. There was a marked improvement in the prices of food over the famine rates of the preceding year, but they still ruled high. The rainfall of the year was very abundant, being $13\frac{1}{5}$ inches more than that of 1869, and $11\frac{2}{3}$ inches above the average. After the excessive rainfall of the last four months of the preceding year, there came defective falls in the first two months of 1870; and with these the abatement of the preceding year's epidemic, which had set in in December 1869, was arrested in January, and renewed increased activity in February (see Tables Nos. II. and IIA., North-Western Provinces history section). In March the fall was greatly in excess of average, and falling upon a thirsty soil stimulated the commencing evaporation of the preceding month, and with this cholera continued with increasing activity; in April, though above average, the fall was very light, and under the increasing temperature gave free play to the drying up of the

previous heavy rain, and cholera made great advance. In May the fall was very greatly below average, and with the hotter temperature stimulated evaporation from a drying-up soil; cholera at the same time rose to the climax of its activity. In June the monsoon rains set in with a heavy fall, very greatly in excess of the average, which quenched the soil and considerably checked evaporation; cholera immediately began to abate. In July another fall in excess of average, but to a less extent, kept up the conditions established in the preceding month, and cholera continued to abate. In August again an excessive rainfall, more in excess than that of the month preceding, should have confirmed the previously established conditions and still further repressed evaporation; but the high temperature of the season and the previous thirsty condition of the soil appear to have deprived this heavy fall of much of its power to saturate the soil, and evaporation continued active, to judge from the check to the abatement of cholera and its renewal of an increased activity in this month. In the next two months, with greatly diminishing falls, though both markedly above average, the drying up of the previous heavy falls went on unhindered, and cholera also steadily advanced unchecked. In November there was no rainfall, and the last of the drying up was completed more rapidly; with this cholera still continued slightly increasing. In December light showers and diminished temperature largely checked evaporation, and cholera, ceasing to increase, began to abate.

In the Punjab the cholera death-rate of 1870 among the troops and jails was a blank against 9.77 per mille of strength in 1869; among the civil population it was only 0.03 per mille against 0.53, respectively. Food, though still very dear, was considerably cheaper than under the famine rates of the preceding year. The rainfall of the year was 7½ inches less than that of the preceding, which itself was fully equal to the average. The falls were uniformly below average in all the months excepting March and June, in which they were above average. The excess fall in March temporarily checked cholera activity; but with the drying up in April this was resumed. The excess fall in June, falling on thirsty soil, set free some evaporation above the ordinary, and this was responded to by a rise in cholera activity proportioned thereto. The even course of the rainfall and its small amount furnished no violent contrasts and no great supply of material for more than ordinary evaporation, and cholera presented no violent activity nor more than ordinary prevalence.

1871.—In this year, the third and last of the cycle, the periodical cholera epidemic, which made its appearance in 1869, completed its triennial course and subsided to a minimum of prevalence. The death-rate for the troops and jails was 0.70 per mille of strength against 1.68 in 1870 and 6.69 in 1869; for the civil populations the rates were 0.35 per mille against 0.75 and 2.15, respectively. The death-rate among the civil populations in 1871 includes the provinces of Bengal and Assam, which are not included in the other two years, so that the figures are higher than they should be for strict comparison. The decline in the death-rate of 1871 is observable in the returns of all the provinces excepting Assam, in which there was a considerable rise, and in none of them, excepting Assam, did the rate exceed 1.0 per mille of population. This general subsidence of epidemic cholera was coincident with a continued improvement in the prices of food in all the provinces, and with unusual cheapness in several of them, especially Madras, Central Provinces, Bengal, and the North-Western Provinces and Oudh. In Assam, however, prices still continued high. The rainfall of the year was equal in amount to that of the preceding, but was differently distributed, giving a generally heavier and above-average fall in the first five months,

thus preventing the occurrence of drought prior to the advent of the monsoon rains. The course of the cholera of the year was in due relation to the rainfall, and presents no marked activity until the drying up after the monsoon rains, under a defective rainfall in the last three months of the year (see Tables Nos. II. and IIA. at the head of this section).

In Madras the death-rate among the troops and jails in 1871 was 1.49 per mille of strength against 1.12 in 1870. Among the civil population it was 0.72 per mille against 2.32, respectively. Food was greatly cheaper in this than in the preceding year. The staple food-grain, millet, was fully 11 sers the rupee cheaper. The rainfall of the year was much the same in amount as that of the preceding, and was still considerably above average. Its falls in the first five months of 1871 were uniformly greater than in the same months of 1870, and thus prevented drought in the early half of the year, the falls being also uniformly above average, except in May (see Tables Nos. II. and IIA., Madras history section). The heavy fall in January, following the defective falls in the last two months of 1870, was attended with a renewed activity of cholera, and this was maintained at a reduced rate under the lesser fall in February. A heavy fall again in March, followed by another in April, checked too free evaporation, and cholera remained stationary at a further reduction of activity. In May a defective fall encouraged evaporation, and cholera continued active, but still abating. In June a fall varying little above average still kept evaporation within bounds, and cholera made little progress. In July a fall considerably above average should have sufficed to check evaporation very markedly, and with it cholera also, but the disease still maintained its previous activity, with a slight increase, due probably to local circumstances. The fall in August was much below average, and must have given free play to drying up of the previous falls; and with this, according to previous experience, we should look for marked increase in cholera activity. Contrary to expectation, however, the disease ceased activity and abated very markedly. In September the fall was much above average again, and should have checked evaporation and cholera activity, and this it appears to have done, for the disease continued steadily abating. In October the fall was greatly below average, and should have been attended by freer drying up and more active cholera; but the disease, contrary to previous experience, remained unaffected, and steadily continued its abatement. In November, however, with a fall greatly in excess of average, the disease renewed fresh activity, and increased greatly with the succeeding light fall in December. The course of the cholera of 1871 in relation to the rainfall presents an irregular divergence from the ordinary course in the months of August and October. It is the first irregularity of the kind yet met with, and I am unable to offer any explanation to account for so marked a departure from the general rule hitherto observed so unbrokenly in respect to the relation of cholera activity to the effect of rainfall on the soil; except by the supposition that the irregularity is merely apparent and not real, owing to the fact that the conditions of the localities in which the cholera mortality and rainfall were in the normal relation are reckoned together with the general provincial statistics of rainfall, which include many places in which there was no cholera at all.

In Bombay the death-rate of 1871 among the troops and jails was 0.17 per mille of strength against 0.10 in 1870; among the civil population it was 0.41 per mille against 0.20, respectively. Food was still dear, but prices were cheaper than in the preceding year. The rainfall of the year was $12\frac{1}{10}$ inches less than that of the preceding; it was also less than the average by $10\frac{7}{10}$ inches. The fall in January was greatly in excess of average, and was

attended by a marked abatement in the prevalence of cholera from that obtaining in the preceding month (see Tables Nos. II. and IIA., Bombay history section). In the next two months the falls were below average, but, after the heavy rainfall of the preceding year, there was no thirst of soil, and, with the low temperature of the season, no inordinate drying up, and cholera continued slowly subsiding. In April the fall was slightly above average, and cholera continued abating. In May the fall was considerably above average, and this, with the increased temperature of the season, set free evaporation; cholera immediately renewed activity and increased greatly. In June the first falls of the monsoon rains were very greatly in defect, and gave fresh impetus to the activity of evaporation; at the same time cholera continued to increase. In July the fall was again greatly in defect; cholera continued increasing. In August again the fall was in marked defect, but the monsoon rains had largely saturated the soil and to some extent checked freer evaporation; cholera remained stationary. In September again a defective supply, with the falling temperature, confirmed the previously established conditions, and cholera commenced to abate rapidly. In October again a defective fall allowed of some drying up of the previous rains, and the abatement of cholera was checked. In November a fall greatly in excess of average checked the drying up, and cholera again immediately abated. In December the fall was greatly below average, and allowed of some drying up; cholera ceased to abate, and slightly increased. From June to October inclusive the falls were uniformly in defect; there were no contrasts of excess and defect in the successive monthly falls, and hence the even course of cholera in these months.

In the Central Provinces the death-rate of 1871 among the troops and jails was 0.25 per mille of strength against 0.11 in 1870; among the civil population it was at the nominal rate of 0.003 per mille against 0.01, respectively. Food was unusually cheap in this year. The rainfall was equal to average, and slightly less than that of 1870. The falls in the first two months were above average, in the next two below it; in the next three months they were uniformly above average; in August the fall was much below it, in September much above, and then uniformly below average in the last three months. There was no drought in any period of the year, and no cholera beyond sporadic cases.

In Berar the death-rate of 1871 among the civil population was 0.26 per mille against 0.24 in 1870. Food in this year was much dearer than in the preceding, though no famine distress was caused thereby. The rainfall of the year was very greatly in defect, being nearly 25 inches less than that of the preceding, and $12\frac{7}{10}$ inches below the average. The falls were uniformly in defect throughout all the months excepting September and November, in which they were in excess of the average. The cholera of the year commenced in June with the first falls of the monsoon rains on a parched soil, increased in July with the light falls in that month, diminished in August with the excessively scanty supply in that month, increased again with the heavy fall in September, continued active with the drying up in October, and subsided with the heavy fall in November, and continued subsiding with the trivial fall in December.

In Bengal the death-rate of 1871 among the troops and jails was 2.21 per mille of strength against 7.71 in 1870. Food was generally cheap in this year, cheaper also than in the preceding. The rainfall was very abundant, being about $10\frac{6}{10}$ inches above the average, and as much above that of the preceding year. After a rainless month at the close of 1870, the year 1871

opened with no rain in January. Cholera was active in January, and with the light rainfall in February continued so with little change. In March, with a fall above average, cholera increased, and in April, with a fall still more in excess of average upon a thirsty soil, broke into epidemic activity. In May, with another excessive fall, the soil was somewhat quenched, and the advance of cholera was checked; the disease slightly decreased. In June another excessive fall confirmed the previously established conditions, and intensified the saturation of soil and air with moisture; cholera greatly abated. In July again an excess of rainfall intensified the existing conditions; cholera abated to half its prevalence in the preceding month. In August a lesser rainfall, but still above average, allowed of some slight drying up; cholera ceased to abate, and remained stationary. In September again a lesser rainfall, though much above average, and more drying up; cholera renewed activity and increased in prevalence. In October a very greatly lesser rainfall, less also than average, and drying up became more rapid; cholera at the same time broke into fresh epidemic activity. In November and December greatly defective showers and continuous drying up, and cholera progressively increasing (see Tables Nos. II. and IIA., Bengal history section).

In Assam the death-rate of 1871 among the troops and jails was 4.36 per mille of strength against 1.99 in 1870. Food was still dear, but cheaper somewhat than in the preceding year. The rainfall of the year was about 10½ inches less than that of the preceding, and also about the same amount less than the average. In the first three months the falls differed little from those of the same months of 1870, and were uniformly below average. In April the fall was above average, and fell on a thirsty soil; cholera commenced activity. In May the fall was below average, and failed to satiate the soil; cholera increased. In June the fall was very greatly in defect; cholera continued increasing. In July again the fall was much in defect; cholera doubled its previous activity. In August the fall was much in excess of average; the soil was somewhat quenched; cholera ceased to increase, and considerably abated. In September the fall was considerably below average; drying up commenced. Cholera renewed activity and nearly doubled its prevalence in August. In October the fall was much above average, but greatly less than that of September, and insufficient to check the drying up; it only added fresh material for evaporation; cholera increased greatly. In November the slight fall, though above average, did not check the drying up materially; and cholera continued increasing. In December a fall less than half the average aided the drying up; cholera more than doubled the prevalence it acquired in November.

In Burma the death-rate of 1871 among the troops and jails was a blank against 10.47 per mille of strength in 1870; among the civil population it was 0.07 per mille against 0.96, respectively. The rainfall of the year was excessively abundant, being over 29 inches in excess of that of the preceding, and 26¾ inches more than the average. The excess was uniformly distributed over the several months, excepting January, in which there was no rainfall, and April, and November and December, in each of which the falls were in defect. The cholera activity of the year was very mild, and limited to the first three months.

In Central India and Rajputana the cholera death-rate among the troops in these territories was only 0.09 per mille of strength in 1871 against no mortality in 1870.

In the North-Western Provinces and Oudh the death-rate among the

troops and jails in 1871 was 0.57 per mille of strength against 0.93 in 1870; among the civil population it was 0.48 per mille against 0.70, respectively. Food was much cheaper in this than in the preceding year. The rainfall of the year was very abundant, being 16⅔ inches in excess of average and 5 inches more than that of 1870. After the very defective rainfall in the last two months of 1870, there was a more copious, though still very defective, fall in January 1871; with this the abating epidemic cholera of the preceding year suddenly subsided. A heavier fall, and much above average, in February was attended by a check in the subsidence of cholera, the disease being little less prevalent than in January. A very defective fall in March was attended by a renewed activity of cholera, and the disease increased somewhat. In April the fall was above average, and cholera greatly increased. In May the fall was greatly in excess of average, and the increase of cholera was checked, the disease remaining stationary. In June again an excessive fall, more than double the average, saturated the soil, and cholera abated much. In July another heavy fall, greatly in excess of average, and cholera abated still more. In August the fall was little in excess of average and much less than that in July; drying up commenced; cholera renewed activity and increased considerably. In September the fall was greatly in excess of average, but less than that of August, and did not stop the drying up; cholera increased greatly. In October there was no rain; cholera greatly increased. In November also there was no rain; cholera nearly doubled its activity of the preceding month. In December the fall was excessively in excess of the average; the increase of cholera was checked, and the disease began to abate rapidly (see Tables Nos. II. and IIA., North-Western Provinces history section).

In the Punjab the death-rate of 1871 among the troops and jails was 0.04 per mille of strength against no mortality in 1870; among the civil population it was 0.02 per mille against 0.03, respectively. Food was considerably cheaper in this than in the preceding year. The rainfall of the year was considerably more than that of 1870, but still below the average. During the first five months the falls were always below average, except in February, in which month the fall was more than double the average; this served to reduce the temperature and to quench the soil, and slightly checked the previous mild activity of cholera. During the light falls of the next three months cholera slowly and gradually increased, but in June, with an altogether exceptionally excessive fall of nearly two and a half times the average, the soil was at once saturated and the increase of cholera checked. In July the fall was again in excess, and maintained the former state in greater intensity, and cholera diminished by half its prevalence in July. In August the fall was greatly in defect, and some drying up commenced, and the abatement of cholera was arrested. In September the fall was again in defect, and cholera remained stationary. In October there was next to no rainfall; cholera still remained stationary. In November there was no rainfall, and cholera began to increase. In December the fall was above average, and cholera continued to increase.

1872.—In this year, the first of the next triennial cycle 1872–74, the periodical cholera epidemic made its appearance in due course, but, with an abundance of food and cheap prices and a favourable disposition of the rainfall, prevailed with no great severity. The death-rate of the year among the troops and jails was 3.72 per mille of strength against 0.70 in 1871; among the civil population it was 0.89 per mille against 0.35, respectively. The rise in the death-rates for the troops and jails, as well as for the civil populations, was general in all the provinces excepting Madras, in which there was a marked

fall, but nowhere was it high. The prices of food were much the same as in the preceding year, and generally cheap, except in the North-Western Provinces and Oudh, where they were very dear. The rainfall of the year was abundant, and considerably in excess of that of the preceding, as well as of the average. The falls in the first five months were below average, except in January and May, in which they were above it; in the other seven months the falls were all above average, but nowhere was the divergence from the normal amount very great. The cholera of the year commenced activity in March, and in the next month acquired epidemic intensity; in June the disease was checked by the heavy rainfall of that month, with the heavier fall in July it greatly abated, and again increased with the lesser fall in August, but abated again in September with another comparatively heavy fall, and continued abating till December, when it increased again with a heavier fall (see Tables Nos. II. and IIA. at the head of this section).

In Madras the cholera death-rate of 1872 among the troops and jails was 0.47 per mille of strength against 1.49 in 1871; among the civil population it was 0.43 per mille against 0.72, respectively. Food, though still cheap, was somewhat dearer than in the preceding year. The rainfall of the year was very abundant, being $9\frac{8}{10}$ inches more than that of the preceding, and $12\frac{3}{10}$ inches above the average. The falls in the last month of 1871 and the first three months of 1872 were all greatly below average. In January, with the drying up after the heavier showers in the preceding month, there was a marked increase of cholera activity (see Tables Nos. II. and IIA., Madras history section). With the more copious, but still very light, showers of the next two months cholera gradually abated; but with the excess fall in April, and an increasing temperature, the disease again increased, and in May, with another fall in excess of average, doubled its prevalence in April. In June a still heavier fall in excess of average somewhat saturated the soil, and the increase of cholera was at a lessened rate; in July again a still more excessive fall was attended by a more marked check to the advance of cholera, and a continued excessive fall in August arrested the increase of cholera, and the disease began to abate. In the next two months the falls varied little from the average, and with the declining temperature maintained the saturation of the soil, and cholera continued rapidly abating. An excessively heavy fall in November, and another in December, increased the saturation of the already satiated soil, and cholera quickly subsided.

In Bombay the death-rate of 1872 among the troops and jails was 0.47 per mille of strength against 0.17 in 1871; among the civil population it was 1.03 per mille against 0.41, respectively. Food was still dear, and prices varied little from those of the preceding year. The rainfall of 1872 was very abundant, being fully 13 inches more than that of 1871, and nearly $2\frac{1}{2}$ inches above the average. The falls in the first five months of this year, as also in the last month of the preceding, were all below average, except in April, when it was very little above it. The subsiding cholera of the preceding year finally sank to its minimum in January with a very trivial rainfall. In February, with no rainfall, the disease commenced fresh activity (see Tables Nos. II. and IIA., Bombay history section), and gradually increased with the light falls in the next two months. In May, with a more copious, but still defective, fall on a thirsty soil, and under an increased temperature, cholera became epidemically prevalent. The first heavy falls of the monsoon rains in June, much above average, somewhat quenched the parched soil, but not before cholera had greatly advanced in epidemic activity. Another heavy fall, much above average, in July saturated the soil somewhat more; the

increase of cholera was at a greatly lessened rate. In August a fall much below average allowed of some commencement of drying up, and the previously attained progress of cholera continued stationary. In September a heavy fall, greatly in excess of average, again soaked the soil and checked the commencing drying up, and cholera abated at once and rapidly. The defective falls and cooled temperature of the next two months offered no impediment, and cholera continued subsiding, and with an excess fall in December sank to a minimum.

In the Central Provinces the death-rate of 1872 among the troops and jails was 1.13 per mille of strength against 0.25 in 1871; among the civil population it was 0.22 per mille against a mere presence of the disease, respectively. Food was fairly cheap, and prices were much the same as in the preceding year. The rainfall of the year was abundant, and about four inches more than that of the preceding year, which itself was equal to average. After three months of defective rainfall at the close of 1871, the falls in the first three months of 1872 were also greatly in defect. During this period of drought there was no cholera, till the disease commenced activity in December 1871, when the soil began to dry after the heavy rainfall in the preceding September. In January 1872 the disease somewhat increased, but, abating in February, again increased in March. In April, with double the average rainfall, cholera made a start forward towards epidemic activity. In May, with merely trivial showers, its advance was checked; but in June, with an excess fall of the first monsoon rains, the disease advanced again, and continued advancing with the heavy falls in the next two months. In September, with another full fall, the soil was saturated, and cholera began to abate, and with the succeeding copious falls steadily subsided to the end of the year.

In Berar the death-rate of 1872 among the civil population was 0.70 per mille against 0.26 in 1871. Food was considerably cheaper in this than in the preceding year. The rainfall was very abundant, being 21 inches more than that of the preceding, and $8\frac{1}{4}$ inches in excess of the average. During the first five months of 1872 there was no rainfall except in April, when an excessive fall, nearly six times the average quantity, occurred; excepting a few cases in the first two months, there was no cholera during this period; nor did the disease appear in June, barring two deaths, notwithstanding the heavy rainfall in that month. In July, with a still more excessive fall, the disease broke into mild epidemic activity, and with the less than average fall in August made great advance; but this was checked by the excessively heavy fall in September, and the disease greatly abated. In October another excess fall was attended by still further abatement of cholera, and in November, with no rain, the disease nearly ceased, but again revived somewhat with an excess fall in December. The heavy fall in April, preceded by three and followed by one rainless month, appears to have temporarily saturated the parched soil and reduced the temperature, as it was neither attended nor followed by cholera.

In Bengal the death-rate of 1872 among the troops and jails was 5.18 per mille of strength against 2.21 in 1871; among the civil population it was 0.63 per mille against 0.25, respectively. Food was generally dearer in this than in the preceding year, but the rates were not high. The rainfall of the year was greatly in defect, being more than 16 inches less than that of the preceding, and $5\frac{1}{2}$ less than the average. After three months of very defective rainfall at the close of 1871, the fall in January 1872 was nearly up to average, and with this greater fall the revived activity of cholera which

took place in the preceding month was arrested, and the disease commenced to abate. The fall in February was considerably above average, and soaked the soil; cholera continued to abate rapidly. In March the fall was excessively in defect, and some drying up commenced; the abatement of cholera was checked, and the disease prevailed with a distinct increase of activity. In April the fall was again in defect, and this, with the increasing temperature, quickened the drying up; cholera increased much. In May again the fall was below average, but double the amount of the preceding month, and somewhat checked the drying up; the increase of cholera was arrested, and the disease remained stationary. The fall in June was much under average, and allowed of some recommencement of drying up; cholera renewed activity and increased much (see Tables Nos. II. and IIA., Bengal history section). In July the fall was again below average, but less so than in the preceding month, and the fall itself being heavy checked the drying up; with this the advance of cholera was arrested, and the disease abated very markedly. In August the fall was again much below average, but the soil was saturated by this addition to the previous heavy falls, and cholera continued abating. The fall in September was somewhat above average, and increased the previous saturation, and cholera continued steadily abating. In October again the fall was much above average, and cholera went on abating, though at lesser speed, as the drying up of the monsoon rains was commencing. The fall in November was very much in defect, and aided the drying up; cholera recommenced activity and increased very considerably. The fall in December was fully equal to average, but drying up was now active, and cholera increased greatly.

In Assam the death-rate of 1872 among the troops and jails was 5.02 per mille of strength against 4.36 in 1871; among the civil population it was 2.10 per mille against 1.42, respectively. Food was cheaper in this than in the preceding year. The rainfall of the year was very abundant, being nearly 29½ inches more than that of the preceding, and 19 inches in excess of the average. The fall in January was much above average, and somewhat checked the drying up in progress after the preceding year's monsoon rains; the revived activity of cholera which took place in December 1871 was arrested, and the disease abated considerably (see Tables Nos. II. and IIA., Assam history section). In February the fall was much below average, but with the low temperature of the season drying up was not rapidly resumed, and cholera continued abating. The fall in March was more copious and considerably above average; cholera remained stationary, with a slight tendency to decline. In April the fall was much above average, and with the increase of temperature there was more evaporation; cholera started into fresh activity, and more than doubled its prevalence in the preceding month. Another excess fall in May somewhat saturated the soil and checked evaporation; the increase of cholera was arrested, and the disease remained stationary, with a slight tendency to decline. The fall in June was below average, and somewhat relieved the check upon evaporation; cholera remained stationary, with a sensible tendency to renewed activity. In July the fall was much above average, and more completely checked evaporation; the commencing tendency of cholera to renewed activity was at once arrested, and the disease greatly abated. The fall in August was little below average, and kept up the previous impediment to evaporation; cholera continued abating. In September the fall was excessively above average, and cholera sank to the minimum prevalence of the year. The fall in October, still greatly above average, was not much more

than one-fourth that of the preceding month, and drying up of the monsoon rains set in; cholera at once renewed activity, and acquired nearly four times the prevalence of the preceding month. The falls in the next two months were greatly below average; drying up was progressing rapidly, and cholera increased greatly, though with a decided tendency to abatement in December.

In Burma the death-rate of 1872 among the troops and jails was 2.12 per mille of strength against a blank in 1871; among the civil population it was 0.24 per mille against 0.07, respectively. The rainfall of the year was very defective, being $33\frac{1}{2}$ inches less than that of the preceding, and $6\frac{8}{10}$ inches below the average. The falls in the last two months of 1871 and the first four of 1872 were uniformly more or less seriously below the average (see Tables Nos. II. and IIA., Burma history section). In January cholera showed signs of commencing activity, but abated in February. In March and April, with more copious showers and increasing temperature, the disease started into greater activity and slowly increased. The heavy fall in May satiated the thirsty soil; the activity of cholera was arrested and the disease began to decline. Another heavy fall, much below average, in June saturated the soil, and cholera continued subsiding. A still heavier fall, also below average, in July increased the saturation of the soil; cholera showed somewhat greater activity, probably the result of some local outbreak. In August the fall was above average, and intensified saturation; cholera continued subsiding. In the next four months the falls were uniformly below average; cholera continued subsiding, and ceased entirely in November.

In the North-Western Provinces and Oudh the death-rate of 1872 among the troops and jails was 4.79 per mille of strength against 0.57 in 1871; among the civil population it was 1.83 per mille against 0.48, respectively. Food in this year was much dearer than in the preceding. The rainfall of the year was greatly less than that of the preceding, though still well above the average (see Tables Nos. II. and IIA., North-Western Provinces history section). The fall in January was treble the average amount in that month, and was attended by unusual activity of cholera. In February the fall was below average, but the activity of cholera greatly abated, as is often noticed to be the case in this month. In March the fall was again below average, and cholera burst out with marked epidemic violence. In April and May the falls were again below average, and drying up under the increasing heat of the soil, well soaked by the excessive rains of the preceding year and the unusually heavy fall in January, became very active; cholera acquired great epidemic intensity, with a tendency to abatement, in May. In June the monsoon rains set in with a fall well in excess of average, and somewhat checked the drying up of the soil; cholera at once abated very markedly. In July the fall was again in excess of average; the abatement of cholera continued unchecked. In August the fall was still more in excess of average; but cholera, instead of further abating, renewed activity, and nearly doubled the prevalence of the preceding month, owing in most cases to local outbreaks in places where the rainfall in August was greatly less than that in July. In September the fall was somewhat below the average, but it sufficed to keep up the established saturation, and cholera again began to abate. In the next three months the rainfall was uniformly greatly below the average; during the drying up in October cholera showed great activity, little less than that of September, but with the diminishing temperature in November this activity greatly declined, and in December the disease rapidly abated.

In the Punjab the death-rate of 1872 among the troops and jails was 6.57 per mille of strength against only 0.04 in 1871; among the civil population it was 0.50 per mille against 0.02, respectively. Food was comparatively cheap, and prices varied little from those of the preceding year. The rainfall of the year was considerably more than that of the preceding, and also well above the average (see Tables Nos. II. and IIA., Punjab history section). Following an excess fall in the preceding month, the fall in January was also much above average; the commencing activity of cholera in December 1871 was arrested, and the disease abated considerably in this month. In February the fall was much below average, and there was a slight sign of increased cholera. The fall in March varied little under average, and cholera remained stationary; but in April, with a fall again nearly up to average and increasing temperature, the disease began to show greater activity, and in May, with a fall much above average, broke into epidemic prevalence. In June the fall was considerably above average, and somewhat slaked the soil; the epidemic activity of cholera was arrested, and the disease somewhat abated. The fall in July was greatly in excess of average, and more completely slaked the soil; cholera abated greatly. In August the fall was again, but less, above average, and saturated the soil; cholera, however, instead of further abating, acquired greatly increased epidemic prevalence, and this was maintained, at a slight decline, with another excess fall in September. This irregularity is most commonly due to local outbreaks of the disease in places where the rainfall of September was much less than that of August. In the next three months the rainfall was uniformly below average. During the drying up in October, cholera, though fast abating, was still active; but with the diminishing temperature it rapidly subsided in November, and ceased in December.

1873.—In this year, the second of the cycle, cholera appeared, as due in the normal course, in abating prevalence; and this was coincident with generally increased cheapness of food. The death-rate of the year among the troops and jails was 1.55 per mille of strength against 3.72 in 1872; among the civil population it was 0.51 per mille against 0.89, respectively. The abatement was general in all the provinces, excepting Burma and Bengal, and was most marked in Bombay and the Punjab. The rainfall of the year was greatly in defect, being 13 inches less than that of the preceding, and $9\frac{1}{3}$ inches below the average. The deficiency was uniformly through every month of the year, but the amount thereof varied greatly, the fall in February being almost equal to average. The cholera of the year presents no remarkable feature of divergence, but closely followed the ordinary seasonal course in relation to the rainfall.

In Madras the cholera death-rate of 1873 among the troops and jails was 0.03 per mille of strength against 0.47 in 1872; among the civil population it was also 0.03 per mille against 0.43, respectively. Food in this year was somewhat dearer than in the preceding, but prices were still cheap. The rainfall of the year was much less than that of the preceding, and it was also below the average (see Tables Nos. II. and IIA., Madras history section). After extraordinary heavy falls in the last two months of 1872, the fall in January 1873 was extremely trifling; cholera, which was rapidly abating under the heavy rain at the close of 1872, in the opening of 1873, with the drying up under almost complete absence of rain, suddenly renewed activity and increased very markedly. With an exceptionally excessive rainfall in February this activity of cholera was checked, and the disease rapidly abated. During the remaining months of the year the rainfall was always below average,

except in May, when it was in some considerable excess, and in September, when the excess was more marked. The heavy rainfall during the latter part of 1872 and the exceptionally great fall in February 1873 slaked the soil and prevented any drought before the advent of the hot-weather rains, and the generally even seasonable course of the rainfall presented no contrasts of excess and defect in succession beyond the instances mentioned. Cholera, after the check to its commencing activity in February, pursued a very mild ordinary course, fluctuating from month to month in relation with the rainfall.

In Bombay the death-rate of 1873 among the troops and jails was a blank against 0.47 per mille of strength in 1872; among the civil population it was 0.02 per mille against 1.03, respectively. Food in this year was considerably cheaper than in the preceding. The rainfall of the year was greatly in defect (see Tables Nos. II. and IIA., Bombay history section). The fall in January was in defect, and attended by a continued abatement of the cholera of the preceding month; but in February the fall was double the average, and cholera commenced some greater activity, which, however, was only temporary, for in the next month, with a very trivial rainfall, the disease again greatly abated. In the succeeding months, excepting an excess fall in May, and again in November, the rainfall was uniformly below average. After the abatement in March cholera remained stationary with the light showers in April, and again abated with the heavier fall in May, and almost ceased with the first falls of the monsoon rains in June. There was no revival of the disease after this.

In the Central Provinces the death-rate of 1873 among the troops and jails was 0.57 per mille of strength against 1.13 in 1872; among the civil population it was 0.05 per mille against 0.22, respectively. The prices of food were about the same as in the preceding year, and comparatively cheap. The rainfall of the year was greatly in defect (see Tables Nos. II. and IIA., Central Provinces history section). The falls in January and February were both in defect, the latter less so; cholera commenced slight activity in February, and this greatly increased with the slightly more copious showers in March, the rainfall of which was equal to average. With the greatly lesser fall in April the disease rapidly abated, and ceased entirely before the next month; there was no reappearance of the disease till September, when the steady monthly defect of rainfall was interrupted by an excessive fall; only a few cases occurred, and these were followed by a few more in each of the next two months, and then, with another excess fall in December, the disease again ceased.

In Berar there was no appearance of cholera throughout 1873; the death-rate in 1872 among the civil population was 0.70 per mille. There was a marked improvement in the prices of food in this year, but the rate for millet, the staple food-grain, was still high. The rainfall of the year was greatly in defect, being 12½ inches less than that of the preceding, and 4¼ below the average. There were excess falls in February, May, and September.

In Bengal the death-rate of 1873 among the troops and jails was 5.65 per mille of strength against 5.18 in 1872; among the civil population it was 0.94 per mille against 0.63, respectively. Food was considerably dearer in this than in the preceding year. The rainfall was very greatly in defect (see Tables Nos. II. and IIA., Bengal history section). In January, with a fall less than half of average after a fall fully equal to average in the preceding month, cholera greatly abated from its previous prevalence; with another and greatly more defective fall in February the disease continued slowly abating. In March, with a fall above average, cholera renewed

activity and increased greatly. In April another fall above average, and cholera continued increasing. In May a fall little more than half of average was attended by a decline in cholera; another very defective fall in June, and cholera still further declined. In July the fall was slightly above average; cholera again increased, and continued increasing in August with a fall slightly below average. In September the fall was little more than half the average; cholera greatly abated, and continued abating in the next month with another fall very greatly below average. In November the fall was again much in defect, but drying up had commenced; the abatement of cholera was arrested, and the disease slightly increased its activity. In December the fall was nearly treble the average, and stimulated the drying up; cholera increased greatly.

In Assam the death-rate in 1873 among the troops and jails was 3.74 per mille of strength against 5.02 in 1872; among the civil population it was 1.40 per mille against 2.10, respectively. The price of the staple food-grain, rice, was about the same as in the preceding year, but, on the whole, slightly dearer. The rainfall of the year was excessively deficient, being $52\frac{7}{10}$ inches less than that of the preceding, and $33\frac{2}{3}$ inches below the average (see Tables Nos. II. and IIA., Assam history section). The fall in January was much below average, but considerably more than that of the preceding month, and with it there was a very great abatement of cholera. In the next two months the falls were both above average, and still more checked the previous drying up; cholera continued rapidly subsiding, and in March sank to a minimum of prevalence. In April the fall was much below average, and with the increasing temperature gave play to fresh evaporation; cholera immediately recommenced brisk activity. The fall in May was little more than half the average, and gave room for more rapid drying up; cholera increased greatly. In June again the fall was below average, but much less so than in the preceding month; drying up was somewhat checked; the advance of cholera was at a much slower rate. The fall in July was again more seriously in defect, but the heavy falls of this and the preceding month had considerably saturated the soil and air with moisture and greatly checked evaporation; the increase of cholera was arrested, and the disease began to abate. The falls in all the succeeding months were uniformly below average, and steadily kept up the established saturation; cholera continued steadily abating, and in November sank to a second minimum of prevalence, but in December began to renew activity.

In Burma the death-rate of 1873 among the troops and jails was 10.68 per mille of strength against 2.12 in 1872; among the civil population it was 2.99 per mille against 0.24, respectively. The rainfall of the year was more than that of the preceding, but still it was much below the average (see Tables Nos. II. and IIA., Burma history section). Following defective rainfalls in the last three months of 1872, there was no rain at all in the first two months of 1873; in January cholera suddenly commenced activity, and greatly increased in February. With very light showers in March the disease continued increasing, and with more copious showers in April the increase was more marked. In May, with a fall not very much more than half the average supply, the activity of cholera was suddenly checked and the disease greatly abated. In June again, with another but less defective fall, cholera continued slowly abating. This abatement of cholera with defective rainfall after the aroused activity of the disease is contrary to the usual experience, and is accounted for partly by the much greater amounts of the general rainfall sufficing to slake the soil, and partly by local falls in excess of

average in the seats of cholera prevalence there saturating the soil. The fall in July was again somewhat below average, and was attended by a marked renewal of cholera activity, and this was maintained with a distinct increase of prevalence under a fall considerably in excess of average in August. In the next three months the falls were all more or less above average, and cholera, commencing suddenly to abate in September, continued a steady decline till November. In December, with a fall greatly in defect, cholera recommenced activity.

In Central India and Rajputana the death-rate of 1873 among the troops stationed in these territories was 0.09 per mille of strength against 4.05 in 1872.

In the North-Western Provinces and Oudh the death-rate of 1873 among the troops and jails was 1.45 per mille of strength against 4.79 in 1872; among the civil population it was 0.46 per mille against 1.83, respectively. Food was still very dear, and at much the same high rates as in the preceding year. The rainfall of the year was much in defect, being much less than that of the preceding, and also below the average (see Tables Nos. II. and IIA., North-Western Provinces history section). After three months of considerable drought at the close of 1872, the fall in January 1873 was much more copious, though still little more than half the average, and cholera continued abating from the epidemic prevalence of the preceding year. In February the fall was very greatly more in defect, and cholera renewed fresh activity. The fall in March was somewhat above average, and, falling on a thirsty soil under an increasing temperature, greatly increased evaporation from the surface of the soil; cholera nearly doubled its activity in the preceding month. In April, with an advancing temperature and hardly any rainfall, drying up was more active; cholera nearly trebled its prevalence in the preceding month. The fall in May was greatly more copious and equal to average; it checked the drying up; the advancing activity of cholera was checked, and its prevalence was about the same as that of the preceding month. In June the fall was about one-fourth of the average, and this great defect, under the high temperature of the season, again set free rapid evaporation; cholera at once responded with renewed activity, and nearly trebled its prevalence in May. The fall in July was heavy, and considerably in excess of average; it materially checked the previous rapid evaporation; cholera at once ceased increasing, and largely abated its activity. In August the fall was not much more than half that of July, and was, besides, much below average; drying up again recommenced; cholera at once responded with renewed activity and very marked increase of prevalence. The fall in September was equal to that in August, and equally above average; the established conditions were maintained; cholera remained stationary. In the next three months the falls were all much below average and extremely small in amount, and this great defect, with a rapidly and greatly diminishing temperature, gave no encouragement to inordinate evaporation; cholera began to abate rapidly in October, and continued steadily subsiding to the close of the year.

In the Punjab the death-rate of 1873 among the troops and jails was a blank against 6.57 per mille of strength in 1872; among the civil population it was 0.01 per mille against 0.50, respectively. Food was considerably cheaper in this than in the preceding year. The rainfall of the year was greatly less than that of the preceding, and was also somewhat below the average (see Tables Nos. II. and IIA., Punjab history section). After very defective falls in the last three months of 1872, the falls in the first four

months of 1873 were uniformly greatly in defect. There was hardly any cholera till April, when, with the very trivial fall in that month, a few more cases occurred. An excess fall in May checked this commencing activity of cholera, and the prevalence of the disease remained stationary. In June the fall was extremely defective; a few more cases of cholera indicated more active evaporation. In July an excess fall on a thirsty soil at first gave freer evaporation, and cholera slightly increased. The fall in August was up to average, and checked evaporation; cholera at once abated. In the next two months the falls were above average; but cholera increased suddenly in September, and again abated in October, the result most probably of a defective fall in September followed by an excess fall in October in the particular locality of cholera activity. In November the fall was extremely light; in December it was fully equal to average; in both months cholera was almost entirely inactive.

1874.—In this year cholera, as due in the normal course, subsided to the minimum prevalence in its cycle; and this abatement was coincident with a continuance of cheap food generally in all the provinces, excepting Bengal and Assam, in which, also, cholera was more than usually prevalent. In both these provinces the disease prevailed with a greatly increased severity, and this unusual activity was coincident with famine distress and widespread pressure from high prices of food. With the exception of these two famine-stricken provinces, the cholera of 1874 was in general abeyance throughout India. The death-rate among the troops and jails was 0.93 per mille of strength against 1.55 in 1873; among the civil populations it was 0.24 per mille against 0.51, respectively. The prices of food were much the same in this as in the preceding year. The rainfall was much more abundant, the fall in 1874 being nearly 11 inches greater than that in 1873; it was also somewhat above the average. The falls in the first three months, taken together, were well above the average, and with this, following upon the defective falls in the last three months of 1873, cholera was greatly less prevalent than in the earlier of these two periods, though, with the more copious fall in March, the disease showed signs of renewed activity. With the increasing falls and fluctuations below and above average, together with the advancing temperature in the next three months, there was a steady and moderate increase of cholera activity. The falls in the next three months, though varying little from the average, were larger in amount, and saturated the soil and air with moisture to a greater or less extent, and thus checked evaporation; cholera, which commenced to abate with the heavy fall in July, steadily declined in activity through the successive months. With the drying up in the last three months of the year, cholera again renewed activity in October, and maintained it, at a steadily abating rate, to the close of the year.

In Madras there was no cholera mortality among the troops and jails in 1874, and the death-rate in 1873 was only 0.03 per mille of strength; among the civil population the death-rate was only 0.01 per mille against 0.03 in 1873. Food was cheap in both years, but the price of millet, the staple food-grain, was somewhat dearer in this. The rainfall of the year was very abundant, being nearly 10 inches more than that of the preceding, and $8\frac{1}{4}$ inches in excess also of the average. The falls in the first four months were all below average, more or less greatly; in the next three they were greatly above it, and quickly saturated the soil. In August the fall was much below average, and was attended by a marked increase of cholera activity, which had commenced in the preceding month, evidently with the first falling off

of the rainfall and beginning of drying up. This cholera activity and drying up was, however, quickly checked by the very excessive rainfall in September, and was kept in check by another excess fall in October. Slightly defective falls in the last two months of the year were attended by slight signs of more active cholera (see Tables Nos. II. and IIA., Madras history section).

In Bombay the death-rate among the troops and jails in 1874 was 0.06 per mille of strength against a blank in 1873; among the civil population it was merely 0.002 per mille against 0.02, respectively. Food was considerably cheaper in this than in the preceding year. The rainfall of the year was greatly in excess of that of the preceding, and also of the average (see Tables Nos. II. and IIA., Bombay history section). The falls in the first four months of the year were in defect, except in February, when the fall was equal to average; cholera, which just showed its presence in January, disappeared with a slightly increased rainfall in February, reappeared with no rainfall in March, increased a little with the light fall in April, and still more with the excess fall in May. The excess fall in June stopped the disease, and the very excessive fall of the next four months, taken together, prevented any renewal of activity, and with the defective falls of the last two months the disease disappeared altogether.

In the Central Provinces there was no cholera mortality among the troops and jails in 1874, and the death-rate in 1873 was 0.57 per mille of strength; among the civil population the death-rate was merely 0.002 per mille against 0.05, respectively. Food was cheap in both years, but more so in this. The rainfall of the year was very abundant, being nearly 14 inches more than that of the preceding, and 6 inches in excess of the average. The excess fell entirely in the three months of June, July, and August; the falls in all the other months were below average. Throughout the year there was no sign of the presence of cholera, excepting single deaths in June and July, till the month of December, when the disease commenced activity with an extremely defective rainfall, following upon three months of more or less scanty supply.

In the Berar province, as in the year before, cholera was in absolute abeyance during 1874; only two deaths from this cause were registered among the civil population throughout this year against none at all in 1873. Food was cheap in both years, but in this it was much more so. The rainfall of the year was more than that of the preceding, but it was still below the average (see Tables Nos. II. and IIA., Berar history section).

In Bengal the death-rate of 1874 among the troops and jails was 4.83 per mille of strength against 5.65 in 1873; among the civil population it was 2.36 per mille against 0.94, respectively. Food was generally very dear in this year, and in some very extensive areas prices were at famine rates. The rainfall of the year was very greatly, over 16 inches, more than that of the preceding, but was still not quite up to average. The mortality registered from cholera was in selected areas only, and is not comparable with the rainfall on the same terms as the other provinces.

In Assam the death-rate of 1874 among the troops and jails was 9.45 per mille of strength against 3.74 in 1873; among the civil population it was 3.99 per mille against 1.40, respectively. Food in this year was excessively dear, and famine rates prevailed in most parts of the province. The rainfall of the year was extremely in excess of that of the preceding—by no less than 38 inches—and it was in excess of the average also by nearly 4½ inches (see Tables Nos. II. and IIA., Assam history section). After the defective falls in the preceding year, the rainfall in each of the first four months of 1874

was greatly in excess of average, and with these heavy falls there was a steady and slowly progressive increase of cholera. In May, with a fall extraordinarily in excess of average, cholera suddenly increased greatly, and assumed epidemic proportions. In June, with a much less rainfall, both than that of the preceding month and of the average, cholera increased considerably; but with another much heavier fall, though still below average, in July the activity of the disease was checked, and cholera commenced to abate. In the next two months the falls were nearly equal, and kept up the previous saturation of the soil; cholera continued abating. In October the fall was above average, but much less than that of the preceding month, and did not stop the commencing drying up; the abatement of cholera was checked, and the disease slightly increased. In November the fall was greatly in defect; drying up was more active, and cholera recommenced epidemic activity, and continued it at a declining rate through December, in which month also the rainfall was greatly in defect.

In Burma the death-rate of 1874 among the troops and jails was only 0.70 per mille of strength against 10.68 in 1873; among the civil population it was 0.35 per mille against 2.99, respectively. The rainfall of the year was greatly in defect, in respect both to the average fall and that of the preceding year (see Tables Nos. II. and IIA., Burma history section). The fall in each of the first three months was above average. In January the excess fall, following a defect in the preceding month, was attended by an increased cholera activity; the heavier fall in February checked this, and the disease markedly abated; another more excess fall in March still more suppressed the activity of cholera. In April the fall was in defect, and, with the increased temperature, gave freer play to evaporation; cholera immediately renewed activity. The fall in May was above average, checked the commencing evaporation and cholera activity, and the disease greatly abated. The succeeding heavy falls in the next five months thoroughly saturated the soil, and cholera rapidly subsided. The succeeding very light falls in the last two months gave room for a late commencement of drying up, and cholera again showed signs of more activity.

In Central India and Rajputana the death-rate of the troops quartered in these states was a complete blank in 1874 against 0.09 per mille of strength in 1873, thus indicating a general abeyance of cholera in this part of India also.

In the North-Western Provinces and Oudh the death-rate of 1874 among the troops and jails was 0.55 per mille of strength against 1.45 in 1873; among the civil population it was 0.15 per mille against 0.46, respectively. Food, though still dear, was cheaper somewhat than in the preceding year. The rainfall of the year was greatly in excess both of the fall in the preceding year and of the average (see Tables Nos. II. and IIA., North-Western Provinces history section). After three months of very defective rainfall at the close of 1873, the falls in the first five months of 1874 were also uniformly in defect, though less markedly so in the first three months; the heavier falls in these three months were attended by a steady and very marked abatement of cholera from the activity displayed under the very scanty falls at the close of the preceding year; but with the excessive defect in April cholera suddenly renewed fresh activity, and this was continued at an advancing rate under the more copious, but still defective, fall in May. The monsoon rains set in in June with more than double the average fall, and this, sufficing to slake the soil, somewhat checked the advancing rate of cholera, and the disease made comparatively little progress.

In July the fall was much heavier, and also much above average; it somewhat saturated the soil, and cholera rapidly abated. In August the fall was less, but yet above average, and allowed of some commencing drying up; cholera at once responded with a renewal of activity and considerable increase of prevalence. The fall in September was again much smaller, though still above average, and gave freer play to evaporation; the activity of cholera very greatly increased, and continued rapidly increasing with the very defective fall in October. In the two next months there was hardly any rainfall, but the diminishing temperature of the season, more than usually cooled by the heavy rainfalls in the preceding monsoon months, materially checked rapid drying up; the activity of cholera was arrested, and the disease rapidly abated.

In the Punjab the death-rate of 1874 among the troops and jails was only 0.04 per mille of strength against a blank in 1873; among the civil population the mere presence of the disease is marked by a death-rate of 0.004 per mille against 0.01, respectively. Food was comparatively cheap in both years, but prices were somewhat higher in this than in the preceding year. The rainfall of the year was somewhat more than that of the preceding, but still somewhat below the average (see Tables Nos. II. and IIA., Punjab history section). The fall in January was much above average, that of February a little below, and that of March again well above it; cholera merely showed a bare presence in these months. In April, with a fall less than half of average, the disease showed slight signs of commencing activity, and this was maintained, at a weakening rate, under the greatly more defective fall in May. The more plentiful and excess falls in the next two months satiated the soil and checked evaporation; cholera made no progress, and showed signs of abatement. A defective fall in August gave some play to evaporation; cholera showed signs of renewed activity. A lesser, and again defective, fall in September was attended with slightly more cholera; but, with the almost entire failure of rain in the next three months of diminishing temperature, cholera again ceased activity, and showed a mere presence by two or three deaths in each month.

1875.—The cholera of this year, the first of the next triennial cycle, 1875–77, appeared, in the normal periodic course of the epidemic recurrence of the disease, as a cholera of revived activity, but, coincidently with unusual abundance and cheapness of food, prevailed with no great severity. The death-rate of the year among the troops and jails was 2.32 per mille of strength against 1.93 in 1874; among the civil populations it was 2.10 per mille against 0.24, respectively. The cholera of 1875 started into fresh epidemic activity over the whole of India, but prevailed with greater intensity in the Southern Peninsula and in Bengal, and with lesser intensity in Burma and the Punjab. The rainfall of the year was abundant, being somewhat more than that of the preceding, and considerably more than the average. The rainfall in January was well above average, and followed a very defective supply in the preceding month; it was attended by a very great subsidence of cholera activity. The fall in February was a little more copious and fully equal to average; cholera renewed fresh activity. In March the fall was distinctly in defect; the activity of cholera increased. The fall in April, with the first great increase in temperature, was considerably above average; cholera burst into epidemic activity (see Tables Nos. II. and IIA. at the head of this section). In May, with a fall considerably below average, epidemic cholera made greater advance. In the next two months, with falls well above average, cholera made great advances. Another ex-

cess fall in August somewhat saturated the soil; the advance of cholera was checked, and the epidemic began to abate. Another excess fall in September completed the saturation by the monsoon rains; cholera greatly abated. Defective falls in the next three months gave free play to drying up of the previous heavy rains; the abatement of cholera was retarded, and the disease, though steadily decreasing, continued at a high degree of epidemic activity to the close of the year.

In Madras the death-rate of 1875 among the troops and jails was 2.57 per mille of strength against a blank in 1874; among the civil population it was 3.12 per mille against 0.01, respectively. Food was comparatively cheap, and prices were much the same as in the preceding year. The rainfall of the year was greatly in defect, being nearly 13½ inches less than that of the preceding, and about 5¼ inches below the average (see Tables Nos. II. and IIA., Madras history section). After the abundant rainfall in the preceding four months, the fall in January 1875 was only half the average; cholera remained stationary at its previous prevalence. In February the fall was excessively in defect; cholera stirred into activity. In March the fall was more copious, and little short of average; the activity of cholera was abruptly checked, and the disease somewhat abated. With more abundant rainfall and the first great advance of temperature in April evaporation was more free; cholera recommenced activity with greater vigour. The fall in May was much below average, and gave freer play to evaporation; cholera burst into epidemic activity. In the next two months the falls were successively below average; cholera continued greatly and progressively in epidemic increase. In August the fall was above average, and somewhat checked the free evaporation; the epidemic increase of cholera was arrested, and the disease considerably abated. In September the fall, though up to average, was smaller, and allowed of commencing drying up; cholera renewed activity and increased sensibly. Another heavier fall, fully equal to average, in October checked the drying up to some extent; the renewed activity of cholera was also checked, and the disease made little advance. In November a much smaller fall, and much less than half the average, again set free rapid drying up of the previous heavy rainfalls; cholera at once resumed activity and increased greatly. Again a defective fall in December encouraged drying up; cholera continued increasing.

In Bombay the death-rate of 1875 among the troops and jails was 1.69 per mille of strength against 0.06 in 1874; among the civil population it was 2.93 per mille against only 0.002, respectively. Food was somewhat dearer in this than in the preceding year, but prices were comparatively cheap in both. The rainfall of the year was plentiful, for, though less than that of the preceding, it was still considerably above the average (see Tables Nos. II. and IIA., Bombay history section). After defective falls in the last three months of 1874, the fall in January 1875 was also greatly in defect, but that in February was nearly treble the average amount; the bare presence of cholera was indicated by a single death in each month. The fall in March was much less, though still above average; cholera showed signs of commencing activity. In April the fall was greater, and equal to average, and with the increased temperature stimulated evaporation; the activity of cholera greatly increased. The fall in May was much below average, and encouraged evaporation; cholera increased greatly and assumed epidemic proportions. In June the first falls of the monsoon rains were heavy, and considerably above average; they did not saturate the soil, but added greatly to the amount of evaporation; cholera increased to double its

previous prevalence. The fall in July was again heavy and much above average; it somewhat saturated the soil and checked evaporation; the increasing rate of cholera was checked, and the disease made slower epidemic progress. In August a lesser fall, and much in defect of average, increased the saturation of the soil and still more impeded evaporation; cholera began to abate rapidly. In September a greater and very excessive rainfall still further saturated the soil and retarded drying up; cholera continued rapidly abating. The fall in October was very greatly less, and also much below average; it afforded free play to commencing drying up; the abatement of cholera was at once checked and the disease slightly increased. In November the fall was again below average, but less so; cholera again began to abate. The fall in December was fully double the average, and still more checked the drying up at the low temperature of this season; cholera continued to abate rapidly.

In the Central Provinces the death-rate of 1875 among the troops and jails was 1.92 per mille of strength against a blank in 1874; among the civil population it was 1.97 per mille against merely 0.002, respectively. Food in this year was considerably cheaper than in the preceding, prices in both years being unusually low. The rainfall of the year was somewhat more than that of the preceding, and also much above average (see Tables Nos. II. and IIA., Central Provinces history section). After three months of defective rainfall at the close of 1874, the falls in the first five months of 1875 were also more or less in defect, except in February, when the fall was somewhat above average. Cholera in this year commenced activity with the excess fall in February; with the almost absence of rain in March the disease increased markedly; with the very defective fall in April the progress of the disease was slightly checked; but with the more copious, though still defective, showers in May the disease greatly increased, and broke into epidemic activity. In June the first falls of the monsoon rains were abundant, and much above average, but failed to slake the long-thirsty soil; evaporation was active, and cholera greatly increased. The fall in July was excessively abundant, somewhat slaked the soil, and checked the increase of evaporation; at the same time the advancing increase of cholera was checked, and the disease made comparatively little progress. In August the fall was half that of July, and was also somewhat below the average; active evaporation was again set free; cholera, in response, immediately renewed vigorous activity, and increased to nearly treble the prevalence of the preceding month. The fall in September was nearly equal to that of August, and was also markedly above average; the previous active evaporation was much restricted; cholera was at once arrested in its increase, and declined to a prevalence not much more than that of July. In October the fall was much less, but it was much above average, and still more impeded evaporation, aided by the diminishing temperature of the season; cholera continued abating very rapidly. In November there was no rainfall, and drying up commenced at a mild rate; the rapid abatement of cholera was checked, and the disease still continued active, though at half the prevalence of the preceding month. The fall in December was very trivial; cholera continued abating more rapidly, and greatly subsided.

In Berar the cholera death-rate of 1875 among the civil population was 10.20 per mille against a mere presence of the disease in 1874. Food was unusually cheap in both years, and in this year was more so than in the preceding. The rainfall of the year was greatly more than that of the preceding, and was also much above average (see Tables Nos. II. and IIA.,

Berar history section). The excess fell almost entirely in the monsoon months, June to October inclusive. After three months of defective rainfall at the close of 1875, the falls in the first five months of 1876 were all greatly in defect, except in February, when the fall was much in excess of average. No cholera was recorded until May, when the disease suddenly broke out in epidemic activity under very trifling rainfall during the month. In June the monsoon rains set in with an abundant fall much in excess of average; it did not suffice to slake the long-parched soil, and evaporation commenced with much activity; cholera greatly increased with epidemic force. The fall in July was a little less, but fully up to average, and failed to saturate the soil; cholera increased with much epidemic intensity. In August the fall was again less, and less also than average, but, following upon the previous heavy falls, it sufficed to somewhat saturate the soil and check the rapidity of evaporation; the increase of cholera was arrested, and the disease suddenly and greatly abated. In September the fall was excessive, nearly double the average amount; cholera continued rapidly abating. Another excess fall in October was attended by more rapid subsidence of cholera. In the next two months the rainfall was very greatly in defect, but with the diminished temperature and saturated soil drying up was not very active; cholera continued rapidly subsiding, and ceased altogether in December.

In Bengal the death-rate of 1875 among the troops and jails was 3.54 per mille of strength against 4.83 in 1874; among the civil population it was 5.76 per mille against 2.36, respectively. The prices of food were considerably cheaper in this than in the preceding year, when famine rates prevailed, but they were still high. The rainfall of the year was much less than that of the preceding, and also more below the average (see Tables Nos. II. and IIA., Bengal history section). The cholera mortality of the province for this, as in the preceding and the following, year, being recorded only in selected areas, is not comparable with the rainfall of the whole province.

In Assam the death-rate of 1875 among the troops and jails was 6.64 per mille of strength against 9.45 in 1874; among the civil population it was 1.74 per mille against 3.99, respectively. The prices of food were still very high, but somewhat cheaper than in the preceding year. The rainfall of the year was considerably less than that of the preceding, but fully equal to the average (see Tables Nos. II. and IIA., Assam history section). The monthly cholera mortality of this province in this year has not been recorded.

In Burma the death-rate of 1875 among the troops and jails was 0.49 per mille of strength against 0.70 in 1874; among the civil population it was 0.26 per mille against 0.35, respectively. The rainfall of the year was excessively greater than that of the preceding, and also very greatly above the average (see Tables Nos. II. and IIA., Burma history section). After a much more than average supply in the last three months of 1874, the fall in January 1875 was treble the average quantity; it was attended by a complete subsidence of the recommencing cholera activity in the preceding month. In February there was hardly any rainfall and no cholera. In March the fall was more copious, but yet only half the average; cholera showed signs of commencing activity. In April the fall was heavy, and nearly double the average; cholera somewhat increased. The fall in May was much heavier, and nearly quite equal to average; the increase of cholera was checked, and the disease began to abate. In June and July the falls were very heavy, and both well above the average; there was a slight

increase of cholera in both months, owing most generally to local defects of rainfall in the seats of cholera prevalence. In August again the fall was heavy, though much less than the preceding two months' falls, and also much below average; it sufficed to complete the saturation of the soil; cholera almost entirely ceased. In September the fall was again a heavy one, and also much above average; there was no more than a mere presence of cholera. The fall in October was again somewhat above average; cholera disappeared. In November the fall was less than half the average, and drying up commenced; cholera immediately renewed activity with some briskness. In December the fall was trifling and less than a fourth of the average; drying up was more brisk; cholera increased with epidemic prevalence.

In Central India and Rajputana the cholera death-rate of 1875 among the troops in these states was 5.41 per mille of strength against a blank in 1874.

In the North-Western Provinces and Oudh the death-rate of 1875 among the troops and jails was 2.11 per mille of strength against 0.55 in 1874; among the civil population it was 1.54 per mille against 0.15, respectively. Food was considerably cheaper in this than in the preceding year, and prices were now cheap generally. The rainfall of the year was much less than that of the preceding, but it was still well above the average (see Tables Nos. II. and IIA., North-Western Provinces history section). After three months of very defective rainfall at the close of 1874, the fall in January was again in defect, being less than half the average; but it was much greater than that in the preceding month, and somewhat checked drying up; the abating cholera still more subsided. In February the fall was very heavy and nearly double the average; it fell on a thirsty soil beginning to feel the first increase of temperature after the winter cold, and set free some rapid evaporation; cholera at once renewed very brisk activity. In March and April there was hardly any rainfall, and, with the increasing temperature of these months, the heavy fall in February rapidly dried up; cholera immediately assumed epidemic activity, and in April attained to great intensity. In May the fall was well above average, slightly slaked the parched soil and checked the rapidity of evaporation; the rapid epidemic advance of cholera was arrested, and the disease began to abate by a marked decrease of prevalence. In June the fall was markedly below average, but somewhat more slaked the soil and checked the previous free evaporation; the abatement of cholera continued, but very slowly. In July the fall was again below average, but more than three times that of the preceding month, and considerably slaked the soil; cholera was still epidemically active, but abating. In August the fall was somewhat heavier, and also much above average, but it failed to saturate the soil, and under the great heat of the season favoured freer evaporation; cholera renewed activity and increased in epidemic prevalence. In September the fall was much less, but still considerably below average; it allowed of a commencement of rapid drying up; cholera made a great advance in epidemic activity. In October the fall was excessively defective, and favoured a continuance of rapid drying up, but with the falling temperature, cooled by the previous heavy rainfalls below the usual degree, this was not so rapid; the advance of epidemic cholera was checked, and the disease commenced to abate rapidly. There was no rainfall in November, and very little in December; drying up was active in the former and slightly checked in the latter month; cholera continued epidemically active in both, though rapidly declining.

In the Punjab the death-rate of 1875 among the troops and jails was

1.66 per mille of strength against 0.04 in 1874; among the civil population it was 0.36 per mille against a mere presence of the disease, respectively. Food was cheap in both years, but much more so in this than in the preceding. The rainfall of the year was very abundant, being greatly in excess of that of the preceding, and somewhat more so of the average (see Tables Nos. II. and IIA., Punjab history section). After three months of great drought at the close of 1874, the fall in January 1875 was also greatly in defect, but it was more than that of the preceding month, and was attended by a trifling presence of cholera. The fall in February was heavy and much above average, and checked increase of cholera. The fall in March was greatly deficient; cholera maintained its previous presence. In April, with the first great increase of temperature, the rainfall was trifling and very greatly in defect; evaporation received its first stimulus; cholera commenced activity. The fall in May was heavier and above average, and fell on a thirsty soil; evaporation was more active; cholera increased. In June the fall was very defective, less than half the average supply; with the high temperature of the season evaporation received a great impetus; cholera broke into epidemic activity. The fall in July was abundant and well above average, but it failed to slake the thirsty soil, and cholera continued advancing. In August the fall was heavier and greatly above the average, but it failed to saturate the soil, and cholera continued doubling its epidemic activity. The fall in September was excessive, considerably more than four times the average amount; it saturated the soil and checked the rapid epidemic advance of cholera, but the disease prevailed more than in the preceding month. In October the fall was again in excess, nearly double the average; drying up was somewhat retarded; cholera abated considerably, though still epidemically active. Another excess fall in November still further checked drying up; cholera rapidly abated. In December a copious fall, little short of average, kept up the check on drying up; cholera ceased activity and almost entirely disappeared.

1876.—The cholera of this year, the second of the cycle, was due in the normal course as a cholera of abating prevalence in its cycle, but, contrary to the ordinary course, it prevailed with greater severity than that of the preceding year. The death-rate among the troops and jails was 2.89 per mille of strength against 2.32 in 1875; among the civil populations it was 2.32 per mille against 2.10, respectively. The average prices of food were about the same in both years, and unusually cheap. The rainfall of the year was greatly less than that of the preceding, and also less than the average (see Tables Nos. II. and IIA. at the head of this section). After more or less defective falls in the last three months of 1875, the falls in the first six months of 1876 were also uniformly more or less in defect, excepting only the month of March, in which it was slightly in excess of average. The cholera, which was subsiding at the close of 1875, continued steadily subsiding during January and February 1876; but with the more copious and excess fall in March the disease started into fresh activity and prevailed with considerable increase of intensity. In the next three months the falls were all in defect, and cholera continued a steadily progressive increase of epidemic activity. In July the rainfall was heavy and well above the average; the advancing increase of cholera was arrested, and the disease began to abate its epidemic activity. The fall in August was again heavy, though somewhat less than average, and confirmed the saturation effected in the preceding month; cholera abated very rapidly. In September again the fall was heavy, but below average, and kept up the previously established

conditions; cholera continued steadily abating. The fall in October was much less, and also below average, but it kept up the previous saturation; cholera steadily continued abating. The fall in November was trifling, and greatly less than the average; drying up now commenced; cholera immediately renewed activity and increased greatly. In December the fall was again greatly in defect, and offered no impediment to the rapid drying up; cholera acquired greatly increased epidemic intensity.

In Madras the cholera death-rate of 1876 among the troops and jails was 4.26 per mille of strength against 2.57 in 1875; among the civil population it was 5.08 per mille against 3.12, respectively. Food in this year was considerably dearer than in the preceding, though still comparatively cheap. The rainfall of the year was greatly in defect, being nearly $9\frac{1}{4}$ inches less than that of the preceding, and nearly $14\frac{1}{2}$ inches below the average (see Tables Nos. II. and IIA., Madras history section). The fall in January was trifling, and in February there was no rainfall; in both months cholera continued steadily abating from the prevalence acquired at the close of 1875. In March the fall was fully equal to average, and somewhat slaked the soil; cholera abated still more. The fall in April was much below average, and gave play to commencing evaporation under the increasing temperature of the season; cholera at once renewed activity and greatly increased. In the next two months the falls were light and greatly below average; evaporation continued active; cholera continued to increase steadily. The fall in July was nearly up to average, but failed to satiate the thirsty soil, and evaporation went on briskly; cholera went on increasing. In August the fall nearly equalled that of July, and though below average, somewhat slaked the soil; evaporation was checked to some extent; the progress of cholera was at once arrested and the disease began to abate rapidly. In September the fall was again much below average, but it sufficed to confirm the saturation of the soil and still further check evaporation; cholera continued rapidly abating. The fall in October was only one-third of the average, and gave place to commencing drying up; the rapid abatement of cholera was checked somewhat, and the disease continued active, though at reduced prevalence. The fall in November was again very greatly in defect, and encouraged the drying up; cholera renewed activity and increased greatly. In December again the fall was very defective, and drying up went on briskly; cholera increased activity and assumed epidemic severity of prevalence.

In Bombay the death-rate of 1876 among the troops and jails was 1.00 per mille of strength against 1.69 in 1875; among the civil population it was 1.91 per mille against 2.93, respectively. Food was considerably dearer in this than in the preceding year; still prices were not very high. The rainfall of the year was greatly in defect, being $13\frac{1}{3}$ inches less than that of the preceding, and nearly 9 inches below the average (see Tables Nos. II. and IIA., Bombay history section). After the excess fall in December 1875 the fall in January 1876 was very slight, and only one-sixth of the average; cholera increased somewhat over the prevalence of the preceding month. In February there was hardly any rainfall; cholera suddenly broke into very brisk epidemic activity. The fall in March was more than double the average, but still very light; cholera increased greatly. In April the fall was very light again, and only half the average; cholera made slight advance. In May the fall was lighter, and only one-eighth the average; evaporation acquired greater activity; cholera also acquired great increase. The fall in June was heavy, but much below average; it checked the previous free evaporation; the progress of cholera was arrested, and the disease somewhat abated. In July

the fall was much heavier, and also much above average; it confirmed the previous check to evaporation; cholera made little progress. The fall in August was heavy, but much less than that of July, and it was also below average; following the previous heavy falls, it more saturated the soil and impeded evaporation; cholera began to abate. In September the fall was again below average, and less than half that of August; it gave play to commencing drying up; cholera continued abating, but was still very active. In October the fall was trifling, and greatly below average; drying up continued; cholera was still active, but much less so than in the preceding month. There was very little rainfall in November; drying up went on; cholera ceased abating and remained stationary. In December there was no rain; drying up received a fresh impetus; cholera at once renewed brisk activity and increased greatly.

In the Central Provinces the death-rate of 1876 among the troops and jails was 1.76 per mille of strength against 1.92 in 1875; among the civil population it was 2.72 per mille against 1.97, respectively. Food was cheap in both years, and cheaper in this than in the preceding year. The rainfall of the year was greatly in defect, being nearly 13 inches less than that of the preceding, and nearly 4½ inches below the average (see Tables No. II. and IIA., Central Provinces history section). Of the two last months of 1875, there was no rainfall in November, and only a very trifling fall in December; of the two first months of 1876, both were rainless. The cholera, which was rapidly abating at the close of the preceding year, continued subsiding at the opening of this, and nearly ceased in February. In March there was a seasonable rainfall, though somewhat less than average, but it fell on a parched soil, and gave rise to active evaporation; cholera immediately renewed brisk activity in epidemic form, and this was greatly increased in April, which was also a rainless month. The fall in May was only half the average, and gave a fresh impetus to evaporation; cholera continued increasing. In June the fall was again greatly in defect, much less than half the average, but it was more plentiful than that of May and caused freer evaporation; cholera increased much. The fall in July was heavy, and much above average, but it failed to saturate the thirsty soil, and evaporation went on more briskly; cholera advanced greatly. In August the fall was less, but nearly up to average, and somewhat slaked the parched soil and checked the previously active evaporation; the increase of cholera was at once checked, and the disease remained stationary, with a slight tendency to abatement. The fall in September about equalled that of August, and was much above the average; it more extensively saturated the soil and repressed evaporation; cholera abated greatly. In October the fall was very slight, and greatly in defect of average, but the previous heavy falls had saturated the soil, and drying up commenced slowly; cholera continued to abate rapidly. In the next two months there was no rainfall, and drying up set in more actively, but apparently ceased very quickly; cholera broke out into fresh epidemic activity in November, but again suddenly subsided in December.

In Berar the death-rate of 1876 among the civil population was 1.20 per mille against 10.20 in 1875. Food was unusually cheap in both years, but was less so in this. The rainfall of the year was greatly in defect, being 12 inches less than that of the preceding, and 6½ inches below the average (see Tables No. II. and IIA., Berar history section). There was no rainfall in any of the first five months of 1876, excepting a very trifling fall in May. There was no cholera in any of these months, excepting May, when the

disease made its appearance with some slight activity. The fall in June was not much more than half the average; cholera increased more briskly, and continued steadily increasing throughout the monsoon rains. November and December were rainless months; but cholera rapidly subsided, owing to the saturation of the soil and reduction of temperature, almost the whole rainfall of the year having occurred in the five monsoon months, June to October inclusive.

In Bengal the death-rate of 1876 among the troops and jails was 10.13 per mille of strength against 3.54 in 1875; among the civil population it was 3.35 per mille against 5.76, respectively. Food was somewhat dearer in this than in the preceding year. The rainfall of the year was considerably more than that of the preceding, and was also somewhat above the average (see Tables Nos. II. and IIA., Bengal history section). The cholera mortality of this year, being recorded only in selected areas, is not comparable with the rainfall, as in the other provinces.

In Assam the death-rate of 1876 among the troops and jails was 1.38 per mille of strength against 6.64 in 1875; among the civil population it was 2.20 per mille against 1.74, respectively. Food was very dear in both years, but more so in this. The rainfall of the year was a little less than that of the preceding, and also slightly under the average (see Tables Nos. II. and IIA., Assam history section). During January and February the falls were below average, and cholera was active in both months at about much the same rate of prevalence; in March the fall was considerably above average, and there was a very marked increase of cholera. The fall in April was less than average, and cholera still further increased. In May it was much above average; the increase of cholera was checked and the disease began to abate. The fall in June was extraordinarily heavy, and more than 9 inches above the average; cholera remained stationary, with only slight abatement from the preceding month's prevalence; but with another heavy fall in July, though much below average, the soil was more completely saturated; cholera abated more rapidly, and this was steadily continued through the succeeding months of plentiful rainfall until December, when, with a very trivial fall, cholera recommenced activity.

In Burma the death-rate of 1876 among the troops and jails was 2.12 per mille of strength against 0.49 in 1875; among the civil population it was 1.28 per mille against 0.26, respectively. The rainfall of the year was extremely in defect, being more than 26 inches less than that of the preceding, and 12¾ inches below average (see Tables Nos. II. and IIA., Burma history section). In January the fall was equal to that of the preceding month, and greatly below average; cholera abated greatly, and continued abating in February, with a trifling increase of rainfall. In March the showers were more copious, and cholera renewed activity with some energy; a heavier fall in April somewhat slaked the soil and checked the rapid advance of cholera, the increase being at a greatly reduced rate. The fall in May was heavy and nearly up to average, and saturated the soil; cholera at once ceased activity and sank to very low prevalence. In June the fall was much heavier, but it was also greatly below average, by nearly 7½ inches; cholera again renewed activity with energy, and attained somewhat greater prevalence than in April. The fall in July was excessively heavy, and 6⅓ inches above average; cholera at once subsided to less than half the prevalence in the preceding month. In August the fall was much less, and less also than the average by more than 6 inches; the rapid subsidence of cholera was checked, and the disease continued active, though at lower prevalence. The

fall in September nearly equalled that of August, and was slightly above average; cholera increased greatly, owing in most cases to local activity where the rainfall was less than in the preceding month. In October the fall was only half the average, but it kept up the saturation effected by the previous heavy falls, and cholera abated rapidly; the fall in November was not far short of double the average, and confirmed the previous saturation; cholera continued subsiding. In December the fall was very light, but equal to average, and allowed of drying up to commence; cholera renewed activity and increased considerably.

In Central India and Rajputana the cholera death-rate of 1876 among the troops stationed in these territories was 0.10 per mille of strength against 5.41 in 1875.

In the North-Western Provinces and Oudh the death-rate of 1876 among the troops and jails was 0.54 per mille of strength against 2.54 in 1875; among the civil population it was 1.13 against 1.54, respectively. Food was comparatively cheap in both years, but was much more so in this. The rainfall of the year was greatly in defect, being about 8 inches less than that of the preceding and $6\frac{1}{2}$ inches less than the average (see Tables Nos. II. and IIA., North-Western Provinces history section). In January the rainfall was equal to that of the preceding month, but it was very greatly below average; the activity of cholera ceased abruptly, and the prevalence of the disease sank to a low level. In February there was hardly any rainfall; cholera recommenced activity. The fall in March was more abundant, but still little more than half the average; cholera increased much. In April the fall was above average slightly; cholera greatly increased. The fall in May was less than half of average; cholera advanced very greatly. In June again the fall was very greatly in defect; cholera increased more rapidly and attained epidemic intensity. The fall in July was heavy and fully equal to average; it somewhat saturated a thirsty soil and checked the previous free evaporation; the rapid increase of cholera was stopped and the disease subsided very greatly, sinking to the level of the prevalence in May. The fall in August was much less heavy, and though much below average, sufficed to keep up the previous saturation; cholera continued greatly abating. In September the fall was equal to that of August, and well above average; cholera remained stationary, with some increase of prevalence, owing probably to local activity of the disease in places where the rainfall was less than in the preceding month. The fall in October was again much above average, and completed the saturation of the soil; cholera began to abate rapidly, and during the next two months, both rainless, quickly subsided, the mortality in December being much the same as that in January.

In the Punjab the death-rate of 1876 among the troops and jails was 2.74 per mille of strength against 1.66 in 1875; among the civil population it was 0.33 per mille against 0.36, respectively. Food was cheap in both years, but most so in this. The rainfall of the year was much less than that of the preceding, but still well above the average (see Tables Nos. II. and IIA., Punjab history section). The falls in the first two months were nearly equal, and both much below average; cholera showed slight tendency to increased activity. The fall in March was plentiful, and well above the average; cholera abated. In April the fall was somewhat less, but still well above average; cholera showed renewed activity. The fall in May was again less, but also fully equal to average; cholera remained stationary, with slight tendency to increase. In June the fall was about the same as in May, but less than half the average, and with the high temperature of the season gave

free play to evaporation; cholera at once broke into brisk activity. The fall in July was heavy and much above the average, but failed to saturate the soil; cholera increased greatly. In August and September the falls were less than average, and least so in the latter month; cholera continued steadily increasing, but less so in September. The fall in October was unusually heavy, being three and a half times more than the average; cholera immediately ceased increasing and abated greatly. In November the fall was again in excess of average; cholera continued rapidly subsiding, and in December, with a very defective fall, almost entirely disappeared.

1877.—The cholera of this year, the last of the triennial cycle, was due in the normal course as a cholera of minimum prevalence in its cycle; it proved, however, to be a cholera of maximum intensity in this cycle. This irregularity was coincident with a marked rise in the prices of food everywhere, except in the Punjab, and with famine distress in all the provinces of Southern India, excepting only Bombay. The general abundance and cheapness of food during the preceding six years was in this year suddenly succeeded by widespread dearth and famine distress. The rainfall of the year was much more than that of the preceding, but it was still much below the average (see Tables Nos. II. and IIA. at the head of this section). After uniformly defective falls in the last five months of 1876, the falls in the first three months of 1877 were all in excess of average. The fall in January was more than three times the average, and it followed a defect by three-fourths of the average in the preceding month; this excessive fall was attended by an excessive increase in the prevalence of epidemic cholera. In February it was followed by another excessive rainfall of nearly double the average; this somewhat slaked the soil, and cholera greatly abated. The fall in March was again above average, but less so than in the preceding months; the abatement of cholera was less rapid. In April the fall was not quite up to the average; the abatement of cholera was sensibly checked, and the prevalence of the disease was little less than that of the preceding month. In May the fall was more plentiful, but still well below average; cholera somewhat distinctly increased in activity. The fall in June was heavy, though still below average, and somewhat satiated the thirsty soil; the increase of cholera ceased, and the disease commenced to abate rapidly. In July the fall was much below average, and failed to quench the soil; the rapid abatement of cholera was arrested, and the disease prevailed with activity little short of that in the preceding month. In August again the fall, though heavy, was below average; cholera maintained its previous activity, with a slight abatement. Another heavy fall in September, though still short of the average, following upon the previous heavy falls of the monsoon rains, at last somewhat satiated the soil; cholera at once abated greatly. The fall in October was abundant, and much above average; it confirmed the previous satiation of the soil; cholera continued rapidly abating. In November again the fall was above average, but it was much less than that of the preceding month, and gave play to drying up; cholera immediately renewed activity and increased greatly. The fall in December was also greatly above average, and more also than that of the preceding month, but it failed to check the drying up of a scarcely saturated soil; cholera continued to increase.

In Madras the cholera death-rate of 1877 among the troops and jails was 13.14 per mille of strength against 4.26 in 1876; among the civil population it was 12.24 per mille against 5.08, respectively. This greatly increased mortality from cholera was coincident with a sudden rise in the price of food

to famine rates. The rainfall of the year was very abundant, being nearly 19 inches more than that of the preceding, and 4½ inches in excess of the average (see Tables Nos. II. and IIA., Madras history section). After the very defective falls in the last four months of 1876, the fall in January 1877 was again greatly in defect, being only half of the average, and only one-third of that of the preceding month; the renewed epidemic activity of cholera at the close of 1876 was continued with much increase in January 1877. In February the rainfall was nearly double the average, and more than double that of the preceding month; it somewhat restrained free evaporation; the increasing activity of cholera was arrested, and the disease began to abate rapidly. The fall in March was more copious, and more than treble the average supply; cholera continued greatly abating. In April the fall was much below average, and also much less than in March; the abatement of cholera went on unchecked. The fall in May was more plentiful, and much above average also; cholera acquired markedly increased activity. In June the fall was heavy, and well above average; the increased activity of cholera was checked, and the disease abated greatly. In July the fall was very short, much less than half of the average; evaporation got some more play; cholera again increased. The fall in August was again much below average; evaporation went on unchecked; cholera continued increasing greatly. In September the fall was heavy, and much above average; it suddenly checked evaporation; cholera immediately very greatly abated. The fall in October was again heavy, and much above the average, and still further checked evaporation; cholera continued rapidly abating. In November the fall was much less, but still fully equal to average; it gave play to some drying up; the rapid abatement of cholera was checked, and the disease prevailed with comparatively little less activity than in October. The fall in December was much the same in amount as that in November, and was considerably more than double the average; it somewhat checked drying up; the abatement of cholera continued.

In Bombay the death-rate of 1877 among the troops and jails was 2.66 per mille of strength against 1.00 in 1876; among the civil population it was 3.54 per mille against 1.91, respectively. Food in this year was cheaper than in the preceding, and prices were generally low. The rainfall of the year was greatly in defect, being more than 7 inches below the average; it was, however, somewhat more than that of the preceding year (see Tables Nos. II. and IIA., Bombay history section). After the very defective falls in the last five months of 1876, the fall in January 1877 was nearly equal to average, and followed a month of no rainfall at all; the renewed activity of cholera in the preceding month continued increasing. The fall in February was unusually heavy, being four times the average; cholera continued increasing, but less rapidly. In March the fall was much smaller, though about average; cholera continued increasing, and more rapidly. The fall in April, though still very light, was much more copious, and fully double the average; cholera made greater advance. In May the fall was less, and only half the average; cholera remained stationary, with little advance. The fall in June was heavy and well above average; cholera made no advance. This heavy fall seems to have saturated the soil, for in the next two months the falls were very greatly in defect, yet cholera did not increase, but, though still very active epidemically, decreased in prevalence, especially in August, when the rainfall was heavier than in July, and less greatly in defect. The fall in September was somewhat more than that in August, and fully equal to average; cholera abated greatly. It was followed by a lesser fall in Sep-

tember, which, however, was much more than double the average; cholera continued abating. In November the fall was very light, and only half the average; cholera, though abating, was still active. The fall in December was more, and fully treble the average; cholera continued stationary, with a very slight decrease.

In the Central Provinces the death-rate of 1877 among the troops and jails was 0.43 per mille of strength against 1.76 in 1876; among the civil population it was 0.46 per mille against 2.72, respectively. Owing to large exportations to the distressed districts in Madras, the prices of food in this province rose to a very high figure, and in many parts to quite famine rates. The rainfall of the year was abundant, being 6½ inches more than that of the preceding, and nearly 2 inches above the average (see Tables Nos. II. and IIA., Central Provinces history section). Following upon two rainless months, the fall in January 1877 was altogether exceptionally heavy, being more than six times the average; the rapid subsidence of the cholera of the preceding year was arrested, and the disease somewhat increased. The fall in February was again very heavy, and more than double the average; the increase of cholera was marked, but not great. In March again the fall was greatly in excess of average; cholera somewhat abated. The fall in April was excessively heavy, being five times the average quantity; cholera again somewhat abated. In May the fall was less, but more than double the average; cholera recommenced activity and sensibly increased. The fall in June was heavy and well above average, but failed to saturate the soil; cholera increased greatly. In July the fall was heavier, but much below average; it served, however, to somewhat saturate the soil; cholera greatly abated. Another nearly equally heavy fall in August, and but little below the average, completed the saturation of the soil; cholera continued rapidly abating. A much smaller, and only half average, fall in September sufficed to delay commencing drying up; cholera subsided greatly. In October the fall was nearly double the average, but still less than that of the preceding month, and gave play to some drying up; cholera renewed activity and increased greatly. The fall in November was little short of average, and did not materially check drying up; cholera, however, much abated, though still active. The fall in December was excessively heavy, more than seven times the average; it stopped drying up; cholera at once ceased entirely.

In Berar the death-rate of 1877 among the civil population was 0.40 per mille against 1.20 in 1876. As in the adjoining Central Provinces, so here, there was in this year a sudden rise in the prices of food to quite famine rates. The rainfall of the year was much more than that of the preceding, but still considerably below average (see Tables Nos. II. and IIA., Berar history section). After two rainless months, the rainfall in January 1877 was excessively heavy, being just treble the average; the abating cholera of the preceding year subsided entirely in this month. The fall in February was again very excessive, being more than five and a half times the average; there was no sign of cholera. In March the fall was less, but fully equal to average; cholera reappeared with mild activity. The fall in April was more copious, and more than treble the average; the commencing activity of cholera increased, but still very mildly. In May the fall was very light, and less than half the average; cholera increased more rapidly. The fall in June was heavy, but below average, and checked the commencing evaporation of the preceding month; the progress of cholera was arrested, and the disease made scarcely perceptible advance. A heavier, but still very defective, supply in July somewhat saturated the soil; cholera subsided rapidly. Again a

greater fall, and nearly up to average, in August, more completely saturated the soil and air; but cholera considerably increased, owing no doubt to defective rainfall in the locality of its prevalence. The fall in September was greatly less, and also much below average; the increase of cholera continued, slightly advancing. The fall in October, though again less, was well above average; cholera greatly abated. In November the fall was trifling, and only one-fifth of average, but the soil was saturated, and drying up was slow; cholera almost entirely subsided. The fall in December was excessive, and more than six times the average; there was a trivial increase of cholera.

In Bengal the death-rate of 1877 among the troops and jails was 5.83 per mille of strength against 10.13 in 1876; among the civil population it was 2.58 per mille against 3.35, respectively. The price of food was about the same in both years, and high. The rainfall was very little less than that of the preceding year, and was well above the average (see Tables Nos. II. and IIA., Bengal history section). After hardly any rain in the preceding month, the fall in January 1877 was excessively heavy, being more than treble the average; cholera was in high epidemic activity, but there are no statistics to show whether it was increasing or abating. With another heavy fall, nearly double the average, in February, however, the activity of the disease was arrested, and a very great abatement took place. The fall in March was well above average, and cholera continued abating rapidly. In April also the fall was above average, but with the increasing temperature gave some play to evaporation; cholera again increased. The fall in May was much heavier, and also above average; it checked evaporation; cholera again abated greatly. In June the fall was again much heavier, but still much below average; it sufficed to saturate the air more thoroughly; cholera continued rapidly abating. In July and August the falls were very heavy, and above average in both months; the abatement of cholera continued steadily, but very slowly. In September the fall was less, and also below average; cholera renewed fresh activity and increased somewhat. The fall in October was greatly less, and also greatly below average; cholera continued increasing. In November the fall was trivial, and only one-fourth of the average; drying up commenced activity; cholera greatly increased. The fall in December was unusually heavy, four and a half times the average, but was too light to materially check evaporation; cholera went on increasing.

In Assam the death-rate of 1877 among the troops and jails was 3.77 per mille of strength against 1.38 in 1876; among the civil population it was 2.90 per mille against 2.20, respectively. Food was still at high rates, and somewhat dearer in this than in the preceding year. The rainfall of the year was greatly in defect, being 10½ inches less than that of the preceding, and 11 inches below the average (see Tables Nos. II. and IIA., Assam history section). After a very defective fall in the preceding month, the rainfall in January 1877 was greatly above average; the revived cholera of the preceding year somewhat increased. The fall in February was below average; cholera made no advance, but somewhat declined. In March the fall was heavier and much above average; cholera abated considerably. The fall in April was greatly below average, and set free evaporation; cholera renewed activity and increased greatly. In May the fall was heavy and above average, but it failed to saturate the soil; cholera made rapid advance. The fall in June was very greatly in defect; cholera continued slowly increasing. In July the fall was very heavy, and nearly up to average; cholera ceased increase, and began to abate rapidly. The fall in August was again greatly in defect, but cholera continued abating. In September the fall was exces-

sive and greatly above average; cholera abated more rapidly. The fall in October was very light, and little more than half the average; drying up commenced; cholera renewed activity and began to increase. In November and December the falls were well above average, but not heavy enough to stop evaporation; cholera continued steadily increasing.

In Burma the death-rate of 1877 among the troops and jails was 9.70 per mille of strength against 2.12 in 1876; among the civil population it was 2.47 per mille against 1.28, respectively. The rainfall of the year was very abundant, being 22½ inches more than that of the preceding, and 10 inches above the average (see Tables Nos. II. and IIA., Burma history section). There was no rainfall in January, after an average fall in the preceding month; the revived cholera continued increasing. The falls in the next three months were all very light and below average, that in April extremely so; cholera continued increasing month by month. In May the fall was heavier, but only half of average; the increase of cholera ceased, and the disease began to decline. The fall in June was very heavy and much above average, cholera rapidly abated. In July the fall was greater, and also much above average; but cholera greatly increased, owing no doubt to defective falls in the localities of its prevalence. Again in August the fall was still heavier and greatly above average; cholera began to abate. In the next four months the falls were rapidly less and less, and always below average, except in November, when it was double the average; but the previous heavy falls had saturated the soil, and there was no unusually active drying up; cholera continued steadily and slowly abating.

In Central India and Rajputana the cholera death-rate of 1877 among the troops in these territories was 0.55 per mille of strength against 0.10 in 1876.

In the North-Western Provinces and Oudh the death-rate of 1877 among the troops and jails was 0.78 per mille of strength against 0.54 in 1876; among the civil population it was 0.74 per mille against 1.13, respectively. Food was considerably dearer in this than in the preceding year, and prices were high. The rainfall of the year was greatly in defect, being 8¼ inches less than that of the preceding, and 14¾ inches below the average (see Tables Nos. II. and IIA., North-Western Provinces history section). After two rainless months, the fall in January 1877 was very abundant and nearly treble the average supply; the subsiding cholera of the preceding year sank to a low prevalence. The fall in February was less, but it was double the average; cholera recommenced activity. In March the fall was much less, though still above average; cholera burst into considerable epidemic activity. Again the fall was less, but above average, in April; cholera increased greatly. In May the fall was considerably heavier, though not quite up to average; the increase of cholera ceased, and the disease began to abate. The fall in June was heavier, but only half of the average; cholera continued rapidly abating. In July the fall was only a third of the average, but the soil had been satiated by the heavy rains in the early part of the year, and there was no drought; nevertheless the more plentiful fall in this month set free some evaporation; the abatement of cholera was checked, and the disease slightly increased. The fall in August was less, and less also than one-third of the average; cholera was still very active, but at a reduced prevalence. In September the fall was very light, and only one-fourth of average; cholera greatly abated. The fall in October was unusually heavy, and treble the average amount; cholera increased in prevalence. The fall in November differed very little from the average, and was very trifling; cholera abated very rapidly. In

December the fall was excessive, ten times the average; cholera continued abating, but less rapidly.

In the Punjab the death-rate of the year among the troops and jails was 0.02 per mille of strength against 2.74 in 1876; among the civil population it was merely 0.001 per mille, against 0.33, respectively. The price of food was unusually cheap in both years, though slightly less so in this. The rainfall of the year was somewhat more than that of the preceding, and also above the average (see Tables Nos. II. and IIA., Punjab history section). The peculiarity of the rainfall of this year was its equable distribution through the several months, instead of the chief precipitation occurring, as usual, in the hot-weather months. Cholera showed a mere persistent presence, with no attempt at activity.

1878.—The cholera of this year, the first of the next triennial cycle, was, in the normal course, a cholera of revived epidemic activity all over India generally; and this increased prevalence of the disease was attended with high prices for food and much famine distress in all parts of the country. The death-rate among the troops and jails was 4.10 per mille of strength against 3.99 in 1877; among the civil population it was 1.63 per mille against 3.39, respectively. The increase of cholera prevalence was general everywhere, except in Madras and Assam, where the death-rates were lower in this than in the preceding year. The rainfall of 1878 was much more than that of 1877, and it was also considerably above the average (see Tables Nos. II. and IIA. at the head of this section). After the excess falls in the last three months of the preceding year, the falls in January and February 1878 were also both well above average; the increasing cholera at the close of the preceding year greatly abated at the opening of this, and rapidly subsided in February. The rainfall in March was greatly in defect, however, and cholera renewed activity with marked energy and increase of prevalence. The fall in April was somewhat above the average, and stimulated the evaporation set free by the defective fall in the preceding month; cholera advanced with great epidemic activity. The falls in the next three months were all below average; cholera continued steadily increasing. The fall in August was heavy and greatly above average; the advance of cholera ceased and the disease began to abate rapidly. The falls in the next three months were all above average; cholera continued steadily subsiding. In December the fall was very light and short of average; cholera renewed activity and began to increase.

In Madras the death-rate of 1878 among the troops and jails was 3.74 per mille of strength against 13.14 in 1877; among the civil population it was 1.62 per mille against 12.24, respectively. Food was at famine rates in both years, but was somewhat less dear in this. The rainfall of the year was much more than that of the preceding, and also greatly in excess of the average (see Tables Nos. II. and IIA., Madras history section). After the excessive rainfall in the preceding month, that of January 1878 was well below the average; the abating cholera of the preceding year rapidly decreased. In February there was hardly any rainfall; cholera continued rapidly subsiding. With more copious, though still very light, showers, and much below average, in March evaporation got some play; cholera renewed activity and increased considerably. The heavier fall in April, much above average, somewhat checked evaporation; the commencing activity of cholera was checked and the disease somewhat abated. A heavier fall, slightly above average, in May, with the increased temperature of the season, again set free some evaporation; cholera renewed activity and increased greatly. The fall in

June was again heavier, and also well above average, but it failed to satiate the soil; cholera went on increasing. A somewhat heavier fall, also well above average, in July still failed to quench the soil; cholera increased yet more. In August the fall was exceptionally heavy, and greatly in excess of average; it somewhat saturated the soil; the increase of cholera at once ceased and the disease began to abate. Another heavy and excessive fall in September confirmed the previous saturation; cholera continued to abate rapidly. The fall in October was also heavy, and fully equal to average, and intensified the previously established conditions; cholera subsided rapidly. In November the fall was well below average; but cholera continued subsiding, though still active. The fall in December was much above average; cholera renewed activity and much increased.

In Bombay the death-rate of 1878 among the troops and jails was 3.93 per mille of strength against 2.66 in 1877; among the civil population it was 2.89 per mille against 3.54, respectively. The price of food in this year rose to famine rates from comparative cheapness in the year before. The rainfall of the year was exceptionally abundant, being 26½ inches more than that of the preceding, and 19½ inches in excess of the average (see Tables Nos. II. and IIA., Bombay history section). After an excess fall in the preceding month, the rainfall in January 1878 was very trifling; cholera continued slowly abating. In February the fall was slightly less trivial; cholera continued abating. In March the fall was again much lighter; cholera commenced activity and increased greatly. With more copious showers, above average, in April cholera made great advance. Again more copious showers, below average, in May, and cholera continued rapidly advancing. In June the fall was heavy and fully equal to average; the rapid advance of cholera was checked, and the disease made slower progress. The fall in July was very heavy and greatly above average; cholera abated greatly. In the next four months the falls were all excessively above average; cholera went on rapidly abating, and finally subsided to low prevalence in December, in which month there was hardly any rainfall.

In the Central Provinces the death-rate of 1878 among the troops and jails was 10.56 per mille of strength against 0.43 in 1877; among the civil population it was 5.53 per mille against 0.46, respectively. Food was very dear in both years, and somewhat more so in this. The rainfall of the year was little different in amount from that of the preceding, and was somewhat above the average (see Tables Nos. II and IIA., Central Provinces history section), but the monthly distribution was very different in the two years. After an excessive fall in the preceding month, the fall in January 1878 was very defective; there was no cholera in either month. In February the fall was excessive; cholera commenced to show its presence. The fall in March was greatly in defect; cholera commenced activity. In April the fall was much in excess; cholera increased. In May the fall was again in excess; cholera burst into violent epidemic activity. The fall in June was greatly less than half the average, and gave free play to evaporation; cholera increased greatly. In July the fall was very heavy and much above average; evaporation was somewhat checked; cholera advanced less rapidly. An equally heavy fall in August, and more in excess of average, saturated the soil; cholera abated rapidly and greatly. The fall in September was somewhat below average, but it sufficed to confirm the previous saturation; cholera continued abating. The falls in the next two months were fully equal to average, and in December nearly so; cholera went on abating during October and November, but in December suddenly burst out into fresh epidemic activity.

In Berar the death-rate of 1878 among the civil population was 15.60 per mille against only 0.40 in 1877. Food was bordering upon famine rates in both years, but was somewhat less dear in this. The rainfall of the year was very abundant, being nearly 14½ inches more than that of the preceding, and 11¼ inches in excess of the average (see Tables Nos. II and IIA., Berar history section). After an excessive fall in the preceding month, there was hardly any rain in January 1878; cholera had almost completely disappeared. The falls in the next two months were much in defect; cholera ceased and entirely disappeared. The fall in April was treble the average; cholera reappeared in brisk activity. The fall in May was greatly in defect; cholera burst into violent epidemic activity. In June again the fall was greatly in defect; cholera increased greatly. The fall in July was much above average; cholera advanced less rapidly. In August the fall was excessive and more than double the average; cholera continued advancing, but less rapidly. In September the fall was again above average, and with the excessive fall of the preceding month completed the saturation of the soil; cholera at once began to abate and subsided greatly. In October the fall was again excessive; cholera continued rapidly subsiding. In November there was hardly any rain, and in December none; but the soil was thoroughly saturated, and cholera continued subsiding.

In Bengal the death-rate of 1878 among the troops and jails was 8.39 per mille of strength against 5.83 in 1877; among the civil population it was 1.58 per mille against 2.58, respectively. Food was dear in both years, but in this it was much more so, and approached famine rates. The rainfall of the year was little more than that of the preceding, and also little more than average (see Tables Nos. II and IIA., Bengal history section). After an excess fall in the preceding month, the fall in January 1878 was again in excess; cholera greatly abated. In February the fall was in defect; cholera continued abating. In March the fall was heavier, but much in defect; cholera renewed activity and greatly increased. The fall in April was above average; cholera greatly increased. In May the fall was heavy and much above average; cholera greatly abated. The fall in June was again heavy, but greatly below average; cholera continued very active, but at greatly reduced prevalence. In July and August the falls were very heavy and both above average; cholera continued abating, but very slowly. In September and October the falls were again both below average; cholera steadily abated. In the last two months the falls were trifling; drying up commenced; cholera renewed activity and rapidly increased.

In Assam the death-rate of 1878 among the troops and jails was 2.13 per mille of strength against 3.77 in 1877; among the civil population it was 1.70 per mille against 2.90, respectively. In both years food was very dear, and in this year at absolute famine rates. The rainfall of the year was very abundant, being 30½ inches more than that of the preceding, and 19½ inches in excess of the average (see Tables No. II. and IIA. Assam history section). After two preceding months of excess rainfall, the fall in January 1878 was markedly in defect; cholera greatly abated, and continued abating in the following month with a fall above average. In March the fall was more copious, though less than average; cholera recommenced activity and increased considerably. The fall in April was also somewhat below average; cholera continued increasing. In May the fall was much below average; cholera still more increased. The fall in June was very heavy and equal to average; it somewhat saturated the soil; cholera ceased increasing and

abated somewhat. In the next three months the falls were all very heavy and greatly above average; cholera continued steadily and rapidly subsiding. In October the fall was greatly less, though equal to average; it gave place to some drying up; cholera renewed activity and increased markedly. The fall in November was less again, but greatly in excess of average; the advance of cholera was less rapid. In December the fall was slight and much below average; cholera increased more rapidly.

In Burma the death-rate of 1878 among the troops and jails was 13.14 per mille of strength against 9.70 in 1877; among the civil population it was 2.28 per mille against 2.47, respectively. The rainfall of the year was very greatly in defect, being 36 inches less than that of the preceding, and 26 inches below average (see Tables Nos. II. and IIA., Burma history section). The fall in January was equal to that of the preceding month, and to average also; cholera somewhat increased. In February the fall was very light and half of average; cholera decreased. The fall in March was more and fully equal to average; cholera slightly abated. In April the fall was greatly in defect; cholera slightly increased. In May the fall was heavy, but much below average; cholera increased more markedly. The fall in June was very heavy, but much in defect; cholera slowly increased. In July the fall was only half of average, and greatly less than that of June; cholera increased rapidly. The fall in August was much heavier, but greatly in defect; cholera abated much and rapidly. In September the fall was less, and also below average; cholera abated less rapidly. The fall in October was much less, but greatly above average; cholera somewhat increased. In November the fall was very light, but equal to average; cholera continued increasing. The fall in December was nearly treble the average; cholera again abated markedly.

In Central India and Rajputana the cholera death-rate of 1878 among the troops quartered in these states was 5.04 per mille of strength against 0.55 in 1877.

In the North-Western Provinces and Oudh the death-rate of 1878 among the troops and jails was 3.49 per mille of strength against 0.78 in 1877; among the civil population it was 0.80 per mille against 0.74, respectively. The price of food was high in both years, but it was more so in this. The rainfall of the year was in defect of average by $2\frac{3}{4}$ inches, but it was 12 inches more than that of the preceding year (see Tables Nos. II. and IIA., North-Western Provinces history section). Following an excessive fall in the preceding month, that of January was also greatly in excess; cholera rapidly subsided. The fall in February was much less, and also below average; cholera began to renew activity. In March the fall was again less, and also much below average; cholera increased. The fall in April was heavier, and more than treble the average; cholera greatly increased. In May the fall was again somewhat heavier, and double the average; the increase of cholera was checked and the disease remained stationary. The fall in June was very greatly in defect, and little more than that in May; evaporation got free play; cholera increased very greatly. The fall in July was heavy, though much less than average; the increase of cholera was checked and the disease decreased somewhat. In August the fall was heavier, and also above average; cholera renewed activity and increased greatly, owing in most cases to defective falls in the localities of its greater prevalence. The fall in September was less, but fully equal to average; cholera continued very active, but at reduced prevalence. There was only a very light fall in October, and very greatly below average; the previous abating rate of cholera was checked, and the disease somewhat increased. The fall in November

equalled that in October, and was above average; cholera abated much. In December the fall was very light, and only one-third of average; cholera rapidly subsided.

In the Punjab the death-rate of 1878 among the troops and jails was 0.12 per mille of strength against 0.02 in 1877; among the civil population it was 0.01 per mille against 0.001, respectively. The price of food in this year rose very high, verging upon famine rates. The rainfall of the year was somewhat in excess of the preceding and more so of the average (see Tables Nos. II. and IIA., Punjab history section). After the extraordinary excessive fall in the preceding month, the fall in January was equal to average, and that in February double of average; there was a mere presence of cholera. The falls were greatly below average in March, above it in April, and again in May; there was no cholera. In June the fall was very greatly in defect; cholera reappeared and no more. The fall in July was nearly up to average, that of August not far short of double of average; cholera commenced very mild activity and somewhat increased. In September the fall was only half of average; cholera remained stationary. In October the fall was below average; cholera greatly subsided. There was no rain in November; cholera slightly increased. In December the fall was light and very defective; cholera ceased.

1879.—The cholera of this year, the second of the cycle, was in the due course a cholera of abating prevalence in its cycle, but the abatement was neither so great nor so marked as usual. Among the troops and jails the death-rate was 3.09 per mille of strength against 4.10 in 1878; among the civil population it was 1.44 per mille against 1.63, respectively. There was a great rise in the prices of food in this year, and in some parts of the country (the Punjab, Bengal, and Assam) they approached famine rates. The rainfall of the year was much the same as that of the preceding in amount, but not in seasonal distribution, and was well above the average (see Tables Nos. II. and IIA. at the head of this section). The falls in the first four months of 1879 were all less than those in the same months of 1878, in the next three months they were all more than in the same three months of 1878, and in the remaining five months they were all less again, except in December, when the fall was almost equal in both years. The falls in January and February 1879 were both greatly in defect of average; cholera continued rapidly abating. The fall in March was also greatly below average, but it was nearly double that of the preceding month; cholera recommenced activity and increased considerably. In April the fall was still much less than average, but double that of March; cholera advanced greatly. The fall in May was heavier and above average, but it fell on a thirsty soil; cholera made great epidemic advance. In June the fall was very heavy and well above average; it somewhat slaked the soil; cholera was checked in its previous rapid advance, and made comparatively slow progress. The fall in July was heavier, but somewhat below average; it somewhat more slaked the soil; cholera ceased increasing and began to abate. In August again the fall was somewhat heavier, and greatly above average also; it saturated the soil; cholera continued abating greatly and rapidly. The fall in September was greatly less, and less also than average, but it sufficed to confirm the previous saturation; cholera continued subsiding rapidly. In October the fall was well above, and in November nearly up to, average; cholera continued subsiding; but in November, with the light fall and commencing drying up, the subsidence was somewhat checked, and the decrease of the disease was not so marked. In December the fall was very light, and also

below the average; drying proceeded more rapidly; cholera recommenced activity, and made considerable increase in prevalence.

In Madras the death-rate of 1879 among the troops and jails was 0.69 per mille of strength against 3.74 in 1878; among the civil population it was 0.46 per mille against 1.62, respectively. The price of food had become much cheaper in this year, though rates were still high. The rainfall of the year was much less than that of the preceding, but still well above average (see Tables Nos. II. and IIA., Madras history section). After the heavy fall in the preceding month, that in January 1879 was much less, though still above average; cholera increased considerably. The fall in February was very light, and only half average; cholera abated much. In March the fall was unusually great, and more than treble the average; cholera subsided still more. The fall in April was very light and less than half average; the rapid subsidence of cholera was checked and the decrease was less marked. The fall in May was very heavy and double average; cholera somewhat increased. In June the fall was less, and also below average; the increase of cholera was more rapid. The fall in July was heavier, and also well above average, but it failed to saturate the soil; cholera continued rapidly increasing. In August the fall was slightly less heavy, and well above average; it saturated the previously wetted soil; cholera very rapidly and at once abated. The fall in September was somewhat less than, and that in October a little more than, average; they confirmed the previous saturation; cholera continued rapidly subsiding, and during the next two months, with falls varying little from average, nearly ceased altogether.

In Bombay the death-rate of 1879 among the troops and jails was 1.14 per mille of strength against 3.93 in 1878; among the civil population it was 0.43 per mille against 2.89, respectively. Though somewhat less dear in this than in the preceding year, the prices of food were still verging upon famine rates. The rainfall of the year, though fully equal to average, was nearly 19½ inches less than that of the preceding (see Tables Nos. II. and IIA., Bombay history section). After a very trivial fall in the preceding month, there was no rain at all in January 1879; the subsidence of cholera was checked, and the disease was little less prevalent than in the preceding month. The fall in February was nearly double, and in March almost equal to average; cholera greatly subsided, but with slight tendency to increase in March. The fall in April was very much below average, and slightly less also than that in March; cholera began to increase. The fall in May was extraordinarily abundant, and more than four times the average; cholera at once broke into epidemic activity. In June the fall was heavy and well above the average, and partially saturated the soil; the epidemic activity of cholera was checked, and the increase of the disease was at a reduced rate, though still more than double that of the preceding month. The fall in July was much in defect, but it added to the previous saturation; cholera began to abate, and decreased greatly. In August the fall was as much in excess as that in July was in defect; it completed saturation; cholera continued abating. In September the fall was again much in defect; the rapid abatement of cholera was checked, and the disease decreased slowly. The fall in October was less, but slightly above average; cholera again increased. In November the fall was again slightly above average; cholera greatly abated. There was hardly any rain in December; the abatement of cholera was checked, and the disease was little less prevalent than in the preceding month.

In the Central Provinces the death-rate of 1879 among the troops and jails was 4.89 per mille of strength against 10.56 in 1878; among the civil

population it was 3.72 per mille against 5.53, respectively. In both years food was excessively dear, but somewhat less so in this. The rainfall of the year was somewhat more than that of the preceding, and well above the average (see Tables Nos. II. and IIA., Central Provinces history section). There was no rain in January after a seasonable fall, little in defect, in the preceding month; cholera, it appears from the returns, suddenly almost entirely ceased, after a very great epidemic recrudescence in the preceding month. The fall in February was above average; cholera recommenced activity. In March again there was no rainfall; cholera increased briskly. The fall in April was very trifling; cholera burst into active epidemic prevalence. In May the fall was plentiful and greatly in excess of average; cholera increased greatly. The fall in June was heavy and well above average; the rapid increase of cholera was arrested, and the disease began to abate rapidly. The fall in July was heavier, but greatly in defect; it added somewhat, however, to the slaking of the soil; cholera continued abating. In August the fall was excessive and greatly above average; the soil was saturated; cholera continued rapidly abating. The fall in September was well below average, but sufficed to confirm the previous saturation; cholera subsided continuously. The falls in the next two months were greatly in excess and fully equal to average respectively; cholera, rapidly subsiding, ceased in November. There was no rain in December; the soil was thoroughly saturated; there was no cholera.

In Berar the death-rate of 1879 among the civil population was 0.10 per mille against 15.60 in 1878. Food was considerably cheaper in this year, though prices were still very high. The rainfall of the year was much less than that of the preceding, yet well above the average (see Tables Nos. II. and IIA., Berar history section). After a very trifling fall in the preceding November and no rain in December, there was again no rain in January 1879; the subsiding cholera suddenly ceased. The rainfall in February was plentiful, fully double of average, and it was followed by two months of no rainfall; there was no sign of cholera during these three months. The fall in May was excessive, being fully six times the average supply; cholera showed merely a bare presence. In June the fall was well above average, and, with the unusually heavy fall in the preceding month, somewhat suddenly slaked the thirsty soil; cholera commenced to show some activity. The fall in July was greatly below average; cholera increased. In August the fall was greatly above average, and in September less so; cholera rapidly subsided and disappeared altogether in September. In October the fall was again much above average, but in the next two months there was no rainfall; the soil was thoroughly saturated by the previous heavy rains; there was no reappearance of cholera.

In Bengal the death-rate of 1879 among the troops and jails was 13.77 per mille of strength against 8.39 in 1878; among the civil population it was 2.27 per mille against 1.58, respectively. Food was equally dear in both years, and prices verged upon severe famine rates. The rainfall of the year was somewhat less than that of the preceding, but fully equal to average (see Tables Nos. II. and IIA., Bengal history section). After two months of excess falls at the close of 1878, the rainfall in January 1879 was most trifling; cholera considerably abated. The fall in February was much short of average; cholera continued abating, though still active. In March the fall was very slight and extremely in defect; cholera recommenced activity, and at once more than doubled the prevalence in the preceding month. In the next two months the falls were greatly in defect; cholera continued steadily increasing. In June the fall was fully equal to average,

but, with the previous defective falls, failed to satiate the soil; cholera increased greatly and nearly doubled the previous prevalence. The fall in July was heavier and much above average; it somewhat saturated the soil; the increase of cholera was at once arrested and the disease abated rapidly In August the fall was again heavy and well above average, it increased saturation; cholera continued rapidly abating. The fall in September was still heavy and much above average; it completed the previous saturation; cholera went on very rapidly subsiding. In October the fall was greatly less, but well above average; it gave play to commencing drying up; the rapid subsidence of cholera was checked and the disease abated comparatively little. The fall in November was very trifling; drying up went on more rapidly; cholera renewed activity and markedly increased. In December the fall was more than double the average, but it was too light to check the drying up; cholera increased rapidly.

In Assam the death-rate of 1879 among the troops and jails was 6.78 per mille of strength against 2.13 in 1878; among the civil population it was 4.59 per mille against 1.70, respectively. Food, though still very dear, had greatly recovered from the famine rates of the preceding year. The rainfall of the year was again very abundant, being only $5\frac{1}{2}$ inches less than that of the preceding year, but 14 inches above the average (see Tables Nos. II. and IIA., Assam history section). The fall in January was much more than that in the preceding month, both being much below average; cholera abated somewhat. The fall in February was greatly in defect, though itself was much more than that in January; cholera further abated. The defect in the fall in March was equally great as that in February, though the fall itself was much heavier; cholera recommenced activity and increased briskly. In April the fall was little more than half the average; cholera advanced rapidly and made great increase. The fall in May was extraordinarily heavy and greatly in excess of average; it saturated the soil considerably; the increase of cholera was at once arrested and the disease abated greatly. In the next three months the falls were all very heavy, and much in excess of average; cholera continued steadily and rapidly subsiding. The fall in September was much less, and also below average; some drying up commenced; the rapid subsidence of cholera was checked and the disease decreased little. In October the fall was greatly less, but somewhat above average; the subsidence of cholera was arrested and the disease slightly increased. The fall in November was very light and greatly in defect; cholera somewhat decreased. In December the fall was fully double of average; cholera again increased markedly.

In Burma the death-rate of 1879 among the troops and jails was 3.89 per mille of strength against 13.14 in 1878; among the civil population it was 0.59 per mille against 2.28, respectively. The rainfall of the year was very abundant, being 29 inches more than that of the preceding, and 3 inches above average (see Tables Nos. II. and IIA., Burma history section). After the excess falls in the preceding months, the fall in January 1879 was equal to average; cholera continued abating. In the next two months the falls were below average; cholera continued abating. In April the fall was heavy and more than double the average; the abatement of cholera was checked, and the disease decreased but little. The falls in the next three months were all increasingly heavier and all markedly below average; cholera continued more or less stationary, abating at first, and finally increasing a little. In August the fall was slightly above average; cholera distinctly decreased. The falls in the next two months were also above average;

cholera continued subsiding. In November the fall was more than double the average; cholera ceased to subside, and remained stationary. The fall in December was also greatly above average; cholera increased markedly. The falls in these two last months were too light to entirely check the commencing drying up.

In Central India and Rajputana the cholera death-rate of 1879 among the troops in these states was 0.18 per mille of strength against 5.04 in 1878.

In the North-Western Provinces and Oudh the death-rate of 1879 among the troops and jails was 0.63 per mille of strength against 3.49 in 1878; among the civil population it was 0.81 per mille against 0.80, respectively. Food was very dear in both years, and with little difference in the rates of either. The rainfall of the year was very abundant, being 16 inches more than that of the preceding, and 13⅓ inches above the average (see Tables Nos. II. and IIA., North-Western Provinces history section). The fall in January, though slightly more than that of the preceding month, was greatly in defect; cholera suddenly subsided to low prevalence. The fall in February was more copious, but still very much below average; cholera subsided still more. In March the fall was still much in defect, and also much less than that in February; cholera recommenced brisk activity and increased considerably. The fall in April was very trifling, and only one-eighth of the average; cholera assumed marked epidemic activity. In May again the fall was very light and little more than one-fourth of average; cholera advanced rapidly and greatly. The fall in June was heavy and much in excess of average; it somewhat slaked the thirsty soil; the rapid increase of cholera was checked and the epidemic began to abate. The falls in the next three months were all more or less heavy and greatly in excess of average; cholera continued steadily abating. In October the fall was greatly less, but still well above average; it gave play to some drying up; the abatement of cholera was checked and the disease remained stationary with a prevalence equal to that of the preceding month. There was no rainfall in November; cholera still continued active, but at greatly reduced prevalence. In December the fall was much above average; cholera rapidly subsided.

In the Punjab the death-rate of 1879 among the troops and jails was 7.48 per mille of strength against 0.12 in 1878; among the civil population it was 1.49 per mille against 0.01, respectively. Food, which was dear in the year before, in this year rose to famine rates. The rainfall of the year was very defective, being 7⅝ inches less than that of the preceding, and 3⅝ inches below the average (see Tables Nos. II. and IIA., Punjab history section). Following upon four months of defective rainfall, the falls in the first two months of 1879 were still more greatly in defect; cholera showed slight signs of increasing activity. But the heavy and excess fall in March temporarily checked these signs. In April the fall was very light, less than a sixteenth of the average; this great defect, following upon the excessive fall in the preceding month, under the increasing temperature of the season, gave free play to active evaporation; cholera at once burst into considerable epidemic activity. In May the fall was again light and greatly in defect; cholera acquired great epidemic increase. The fall in June was heavy and nearly double the average; the increase of cholera was arrested and the epidemic began to abate. In July the fall was heavier, but much below average; cholera continued very active, but in abating prevalence. In August the fall was again heavier, and also much above average; cholera continued slowly abating. The fall in September was very light, and also

much below average, but the soil was saturated by the previous heavy falls, and cholera continued rapidly abating. In October the fall was very trifling and greatly in defect; drying up commenced; but cholera continued subsiding, and with no rainfall in November almost ceased activity altogether. The fall in December, however, was more copious and fully up to average; it supplied some material for evaporation; and cholera distinctly increased.

1880.—The cholera of this year, the last of the triennial cycle, was, in the normal course, a cholera of minimum or subsiding prevalence in its cycle. And this subsidence of the disease was coincident with a return of cheap prices of food in all the provinces generally, excepting the Punjab, where famine rates still prevailed. The death-rate of the year among the troops and jails was 1.27 per mille of strength against 3.09 in 1879; among the civil population it was 0.64 against 1.44 per mille, respectively. The rainfall of the year was much less than that of the preceding, and also somewhat less than the average (see Tables Nos. II. and IIA. at the head of this section). The falls in January and February were respectively below and above average; cholera continued steadily abating. In March the fall was more plentiful and well above average; cholera recommenced activity and began to increase. In April the fall was heavier, and also well above average; cholera increased greatly. The fall in May was again more, but considerably below average; cholera greatly abated. In June the fall was heavy, and also above average; cholera continued abating. The fall in July was heavier, but less than average; cholera still continued abating. In August the fall was much less, and also much below average; cholera increased greatly. The fall in September was a little less again, and also a little less than average; cholera again greatly abated. The falls in the next two months were much less, that of October below and that of November above average; the rapid abatement of cholera was checked, and the disease remained stationary at a somewhat reduced prevalence during both months. In December the fall was light, but a little above average; cholera distinctly increased.

In Madras the death-rate of 1880 among the troops and jails was 0.06 per mille of strength against 0.69 in 1879; among the civil population it was 0.02 per mille against 0.46, respectively. Food was markedly cheaper in this year, and prices were unusually low. The rainfall of the year was somewhat above that of the preceding, and more so above the average (see Tables Nos. II. and IIA., Madras history section). The fall in January was below average, that in February above it; cholera increased a little in the first and more in the other. In March there was hardly any rain; cholera was less active. The fall in April exceeded average; cholera increased. In May it was less than average; cholera more increased. In June the fall was heavy and nearly equal to average; cholera much decreased. The fall in July was equally heavy, though somewhat less than average; cholera remained stationary. In the next three months the falls were all below average; cholera decreased and nearly disappeared altogether. In November the fall was extraordinarily heavy; cholera slightly increased. In December, though greatly less, it was again above average; cholera increased much.

In Bombay the death-rate of 1880 among the troops and jails was 0.12 per mille of strength against 1.14 in 1879; among the civil population it was 0.04 per mille against 0.43, respectively. Food was greatly cheaper in this year, but prices were still high. The rainfall of the year was less than

that of the preceding, and less also than average (see Tables Nos. II. and IIA., Bombay history section). There was no rain in January; cholera increased much. In February the fall was above average; cholera rapidly abated. The fall in March was again above average; cholera subsided more quickly. In April the fall was below average; cholera slightly increased. In the next three months the falls were all below average; cholera quickly sudsided and nearly disappeared. The fall in August was very defective; cholera slightly increased. In September the fall was greatly in excess; cholera again slightly increased. In the next two months the falls were again in excess; cholera almost entirely ceased. The fall in December was exceedingly light; cholera increased briskly.

In the Central Provinces the death-rate of 1880 among the troops and jails was 2.18 per mille of strength against 4.89 in 1879; among the civil population it was 0.04 per mille against 3.72, respectively. Food in this year was unusually cheap after the famine rates of the year before. The rainfall of the year was less than that of the preceding, but it was fully equal to average (see Tables Nos. II. and IIA., Central Provinces history section). As in the two preceding provinces, so in this, the cholera of 1880 was at very low prevalence, and as usual fluctuated with the nature of the rainfall and the condition of the soil.

In Berar the death-rate of 1880 among the civil population was a blank, only a single cholera death having been registered throughout the year against 0.10 per mille in the preceding year. Food in this year was extraordinarily cheap. The rainfall was greatly in defect, being $14\frac{1}{8}$ inches less than that of the preceding and $9\frac{3}{4}$ inches below the average. In the first five months there was hardly any rain at all, the entire falls in this period amounting to only 0.24 inch. In the next three months again the falls were all greatly in defect. In September the fall was excessive, as also in November, whilst in October it was nearly equal to average. In December again there was no rainfall.'

In Bengal the death-rate of 1880 among the troops and jails was 1.39 per mille of strength against 13.77 in 1879; among the civil population it was 0.66 per mille against 2.27, respectively. Food, though still dear, was considerably cheaper than in the preceding year. The rainfall of the year was very abundant, being $6\frac{3}{4}$ inches more than that of the preceding and the average alike (see Tables Nos. II. and IIA., Bengal history section). The fall in January, though below average, was more than that of the preceding month; cholera greatly abated. The fall in February was unusually heavy and treble the average; the rapid abatement of cholera was checked and the disease decreased but little. In March the fall was less, but again well in excess of average: cholera increased markedly. The fall in April was very little less, but it was greatly below average; cholera increased greatly. In May the fall was heavy and well above average; the increase of cholera was checked, and the disease remained stationary at about the same prevalence as in the preceding month. The fall in June was much heavier, and much above average also; cholera rapidly decreased to half the prevalence in the preceding month. In July the fall was again heavy, and well above average also; cholera continued rapidly abating. The fall in August was again heavier, and also more above the average; cholera continued abating, but more slowly, owing generally to an increased activity in localities where the rainfall was in defect. In September the fall was greatly less, and less also than average; cholera continued abating. In October the fall was again less, but well above average; drying up commenced; cholera increased. The

falls in November and December were very light and successively below and above average; cholera continued increasing rapidly and greatly, especially with the lighter fall in December.

In Assam the death-rate of 1880 among the troops and jails was 2.68 per mille of strength against 6.78 in 1879; among the civil population it was 0.74 per mille against 4.59, respectively. Food in this year was much cheaper than in the preceding, but prices were still somewhat high. The rainfall of the year was somewhat less than that of the preceding, but still greatly above average (see Tables Nos. II. and IIA., Assam history section). After double average fall in the preceding month, the fall in January 1880 was also about double the average; cholera remained stationary at the same prevalence in both months. The fall in February was less above average; cholera increased markedly. In March the fall was excessively heavy, being more than treble the average; at once the increase of cholera was checked and the disease abated markedly. Again in April the fall was very heavy and much above average; cholera somewhat increased, owing most likely to activity in localities of defective fall. In May the fall was much less, and much below average also; cholera was somewhat less. In June the fall was very heavy and much above average; cholera remained stationary, with a slight tendency to decline. The fall in July was less than average; cholera rapidly abated. In August also the fall was heavy and much above average; cholera much subsided. The fall in September was less, and less also than average; cholera slightly increased. In October the fall was much less, but well over average; drying up commenced; cholera renewed activity and increased. The fall in November was in defect, that in December greatly in excess; cholera continued steadily increasing.

In Burma the death-rate of 1880 among the troops and jails was 0.61 per mille of strength against 3.89 in 1879; among the civil population it was 0.85 per mille against 0.59, respectively. The rainfall of the year was slightly more than that of the preceding, but well above the average (see Tables Nos. II. and IIA., Burma history section). The fall in January, though treble the average amount, was less than half that of the preceding month; cholera increased somewhat briskly. In February the fall was very trifling and very greatly in defect; cholera somewhat decreased. In March the fall was heavier and much above average; cholera continued decreasing. During the next four months the falls were all increasingly great, and all above average; cholera rapidly subsided and almost ceased. The fall in August was less, but still very heavy; it was also below average, but it sufficed to confirm the saturation of the soil; cholera almost entirely disappeared. In September the fall was much less, though still heavy and much above average; some drying up commenced; cholera recommenced activity and increased briskly. In the next two months the falls were lighter and greatly in defect of average; cholera increased greatly and steadily. The fall in December was again lighter, but it was double of the average; the advance of cholera was checked and the disease decreased much.

In Central India and Rajputana the cholera death-rate of 1880 among the troops in these states was a blank against 0.18 in 1879. There appears to have been no cholera at all in this part of India during 1880.

In the North-Western Provinces and Oudh the death-rate of 1880 among the troops and jails was 2.64 per mille of strength against 0.63 in 1879; among the civil population it was 1.67 per mille against 0.81, respectively. Food prices were still high, but they were considerably cheaper in this than in the preceding year. The rainfall of the year was greatly in defect, being

22⅔ inches less than that of the preceding, and 9⅓ inches below the average (see Tables Nos. II. and IIA., North-Western Provinces history section). After a full fall in the preceding month, that in January 1880 was very greatly in defect; cholera continued equally prevalent in both months. The fall in February was heavier and greatly above average; cholera somewhat increased. In March there was no rain; cholera broke into active epidemic prevalence. The fall in April was very light and greatly in defect; cholera made extraordinary great advance. In May the fall was heavier and greatly above average; cholera suddenly and greatly abated. The fall in June was heavier again, but much below average; cholera continued abating. In July the fall was very heavy and fully equal to average; cholera continued abating. The fall in August was very light, and less than one-third of the average; cholera suddenly increased very greatly. In September the fall was again heavy, double that in August, and nearly up to the average; it checked the evaporation set free by the light fall in that month; cholera at once again greatly abated. The fall in October was very light, and also greatly in defect of average; cholera continued abating but slowly. In November the fall was heavier and greatly in excess of average; cholera continued abating. In December the fall was again above average; cholera abated more rapidly.

In the Punjab the death-rate of 1880 among the troops and jails was 1.28 per mille of strength against 7.48 in 1879; among the civil population it was 0.01 per mille against 1.49, respectively. Food in both years was very dear, and bordering upon famine rates, and there was but little difference in the prices of the two years. The rainfall of the year was somewhat less than that of the preceding, and more markedly so than the average (see Tables Nos. II. and IIA., Punjab history section). After the excess fall in the preceding month, that in January 1880 was much in defect; cholera almost disappeared. The fall in February was heavy and above average; cholera showed slight movement. In the next three months the falls were very light, but progressively more copious, and all much below average; cholera slowly increased till May, when it slightly decreased. In June the fall was heavy and much above average; cholera increased distinctly. In July the fall was very heavy and greatly above average; cholera decreased. The fall in August was very light and greatly in defect; cholera much increased. In September the fall was little less than that of August, and was also below average; cholera again decreased. In October there was no rain; cholera again greatly increased. The fall in November was very light and much in defect; cholera abated much, but was still active. In December the fall was heavier, and also above average; cholera subsided and nearly disappeared.

1881.—The cholera of this year, the first of the next triennial cycle 1881–83, was, in the normal course, a cholera of revived epidemic activity, although this activity was of a very mild kind, like that of 1872. The mildness of the epidemic cholera of this year was coincident with the continuance of generally cheap rates of food in all the provinces excepting the Punjab, and, to some extent, the North-Western Provinces and Oudh also. The death-rate of the year among the troops and jails was 2.29 per mille of strength against 1.27 in 1880; among the civil population it was 0.86 per mille against 0.64, respectively. The rainfall of the year was more than that of the preceding, and also somewhat more than the average (see Tables Nos. II. and IIA. at the head of this section). After an excess fall in the preceding month, the fall in January 1881 was very light and defective;

cholera increased. With a more copious fall, but only half of average, in February cholera decreased. With a more abundant and well above average fall in March the disease again increased. In April the fall was little more, and still slightly above average; cholera very greatly increased. The fall in May was heavier and fully equal to average; cholera decreased much. The fall in June was much heavier and equal to average; cholera continued decreasing. In the next two months the falls were both much heavier, and also above average; cholera increased steadily. The fall in September was less and below average; cholera again decreased, and continued decreasing with a defective fall in October. In November the fall was in excess, though lighter; cholera again increased, and continued increasing with a defective fall in December.

In Madras the death-rate of 1881 among the troops and jails was 1.66 per mille of strength against 0.06 in 1880; among the civil population it was 0.31 per mille against 0.02, respectively. Food was markedly cheaper in this than in the preceding year, and prices fell unusually low. The rain-fall of the year was much in defect, being nearly 10 inches less than that in the preceding, and nearly 6 inches below average (see Tables Nos. II. and IIA., Madras history section). Following the unusually excessive falls in the preceding months, the fall in January 1881 was very light, and only half of average; cholera suddenly decreased greatly. In February there was no rain; cholera nearly ceased activity. The fall in March was somewhat above average; cholera again somewhat increased. The increase was greater with a light and very defective fall in April. In May the fall was more plentiful, but much below average; cholera remained stationary at the same prevalence as in the preceding month. In June the fall was greater, but much in defect of average; cholera increased briskly. The fall in July was very light, and less than half of average; but cholera greatly subsided. The falls in the next two months were both heavy, and above average also; cholera nearly ceased altogether with the heavier fall in August, but slightly revived with the lighter fall in September. The fall in October was extremely light and greatly below average; cholera acquired epidemic activity. The falls in the next two months were much in excess of average; cholera continued rapidly increasing.

In Bombay the death-rate of 1881 among the troops and jails was 2.43 per mille of strength against 0.12 in 1880; among the civil population it was 1.03 per mille against 0.04, respectively. Food was considerably cheaper in this than in the preceding year, and prices were generally low. The rain-fall of the year was much the same in amount as that of the preceding, and was well below average (see Tables Nos. II. and IIA., Bombay history section). After a trifling fall in the preceding month, there was no rain in January 1881, and only very light showers in the next two; cholera was steadily subsiding during all three. The fall in April was more plentiful and nearly treble the average; the subsidence of cholera ceased, and the disease was nearly as prevalent as in the preceding month. The fall in May was little less and fully equal to average; cholera commenced epidemic activity. In June the fall was light and little more than half of average; cholera increased rapidly. The fall in July was very heavy and much above average; cholera continued increasing, but not so rapidly. In August the fall was much less, but still well above average; cholera increased more rapidly. In September the fall was again much less, and also less than average; cholera greatly abated. In the next three months the falls

were below, above, and again below average; cholera continued steadily subsiding.

In the Central Provinces the death-rate of 1881 among the troops and jails was 2.50 per mille of strength against 2.18 in 1880; among the civil population it was 1.23 per mille against 0.04, respectively. Food was considerably dearer in this than in the preceding year. The rainfall of the year was very abundant, being about 5½ inches more than that of the preceding and of the average alike (see Tables Nos. II. and IIA., Central Provinces history section). After no rain in the preceding month, the fall in January 1881 was most trifling; cholera commenced activity. The fall in February was again very light; cholera increased briskly. In March the fall was very excessive, more than four times the average, but it fell on a very thirsty soil; cholera continued increasing. The fall in April was very light, and little more than a fourth of the average; cholera increased more rapidly and acquired epidemic prevalence. In May the fall was also light, and less than half average; cholera continued increasing rapidly. The fall in June was very heavy and much above average, but it failed to quench the thirsty soil; cholera continued increasing, but less rapidly. In July the fall was much heavier, and also much above average; it somewhat slaked the soil; cholera at once ceased increasing and abated greatly. The fall in August was much less, but still much above average; it failed to saturate the soil; cholera renewed activity and increased greatly. In September the fall was much less, and much below average also; cholera continued active at the same prevalence as in the preceding month. The fall in October was seasonable and little below average; it confirmed the saturation of the soil by the previous heavy falls; cholera began to abate rapidly. In November the fall was greatly above average, and in December there was no rain; cholera rapidly subsided and nearly disappeared in the latter month.

In Berar the cholera death-rate of 1881 among the civil population was 1.56 per mille against a blank in the preceding year. Food was considerably cheaper in this than in the preceding year, and prices were unusually low. The rainfall of the year was abundant, being nearly 14 inches more than that of the preceding, and fully 4 inches above the average (see Tables Nos. II. and IIA., Berar history section). After no rainfall in the preceding month, there was again no rain in January 1881; in February also there was hardly any, but in March the fall was excessive; in April it was again light and defective, and in May equal to average. There was no sign of cholera during these five months. In June the fall was very heavy and much above average; cholera announced its commencing activity by a single death registered in this month. The fall in July was hardly greater, and it was less above average; cholera increased very briskly. In August the fall was markedly less, and it was also well above average; cholera increased greatly. In September the fall was greatly less, and it was also much below average; but it sufficed to confirm the saturation of the soil effected by the previous heavy falls; cholera began to abate rapidly. The fall in October was below average, but cholera continued abating. In November the fall was excessive and greatly above average, fully treble the usual supply; cholera continued rapidly subsiding. In December there was no rain; cholera increased markedly.

In Bengal the death-rate of 1881 among the troops and jails was 4.21 per mille of strength against 1.39 in 1880; among the civil population it was 1.32 per mille against 0.66, respectively. Food was greatly cheaper in this than in the preceding year, and prices fell comparatively low. The

rainfall of the year was much less than that of the preceding, but still well above the average (see Tables Nos. II. and IIA., Bengal history section). After a slightly excess fall in the preceding month, the falls in January and February 1881 were extremely light and defective; cholera continued steadily abating. In March the fall was very heavy and more than double the average; cholera greatly increased. In April the fall was greatly in defect; cholera increased rapidly and very greatly. The fall in May was heavy and well above average; the increase of cholera was arrested and the disease very much abated. In June the fall was much heavier, and also above average; cholera continued rapidly abating. In July the fall was hardly heavier, and was slightly less than average; the abatement of cholera was arrested and the disease increased markedly. In August the fall was greater decidedly, and also well above average; cholera continued increasing. The fall in September was seasonable and but little above average; cholera ceased increasing and greatly abated. The fall in October was somewhat below average, and greatly less than that in September; drying up commenced; cholera renewed activity and began to increase. In the next two months the falls were very light and greatly in defect; drying up went on briskly; cholera increased steadily and rapidly.

In Assam the death-rate of 1881 among the troops and jails was 2.15 per mille of strength against 2.68 in 1880; among the civil population it was 1.30 per mille against 0.74, respectively. Food was considerably cheaper in this than the preceding year, though prices were still somewhat high. The rainfall of the year was greatly less than that of the preceding, though still well above the average (see Tables Nos. II. and IIA., Assam history section). After the very excessive fall in the preceding month, the fall in January 1881 was very light and defective; cholera increased. The fall in February was more copious, but still greatly in defect; cholera decreased greatly. In March the fall was seasonable and nearly up to average; cholera recommenced activity and perceptibly increased. The fall in April was very heavy and much above average; cholera increased slowly. In May the fall was more, and also above average; cholera decreased. In June the fall was very heavy, but below average; cholera again increased markedly. In July the fall was less and very greatly below average; cholera increased, but comparatively very little. The fall in August was more, and also much above average; cholera made no progress, but decreased somewhat. In September the fall was heavier and very greatly in excess of average; cholera decreased very markedly. In October the fall was light and much below average; drying up commenced; cholera increased. In November the fall was nearly up to average; cholera continued increasing. The fall in December was very light and much in defect; cholera decreased.

In Burma the death-rate of 1881 among the troops and jails was 4.04 per mille of strength against 0.61 in 1880; among the civil population it was 1.77 per mille against 0.85, respectively. The rainfall of the year was much above that of the preceding, and more so above the average (see Tables Nos. II. and IIA., Burma history section). After an excess fall in the preceding month, the falls in the first three months of 1881 were all light, and more or less below average; cholera continued steadily decreasing. The fall in April was more copious, though greatly in defect; cholera increased. In May the fall was seasonable and little short of average; cholera continued increasing. In June the fall was much in defect; cholera somewhat decreased, owing generally to excess falls in the localities of its prevalence. The fall in July was greatly in excess of average; cholera increased greatly.

In August also the fall was much in excess; cholera continued increasing. In September the fall was below average; cholera suddenly and rapidly subsided. In October again the fall was below average; cholera subsided still more. In November the fall was greatly in excess; cholera ceased subsiding and slightly increased. In December the fall was very light, but above average; cholera increased briskly.

In Central India and Rajputana the cholera death-rate of 1881 among the troops stationed in these territories was represented by a single death, giving a death-rate of 0.09 per mille of strength against no mortality at all in 1880.

In the North-Western Provinces and Oudh the death-rate of 1881 among the troops and jails was 0.73 per mille of strength against 2.64 in 1880; among the civil population it was 0.60 per mille against 1.67, respectively. Food was much dearer in this than in the preceding year, though prices were not very high. The rainfall of the year was a little below the average, but greatly more than that of the preceding year (see Tables Nos. II. and IIA., North-Western Provinces history section). After an excess fall in the preceding month, the fall in January 1881 was very trifling; cholera suddenly and very greatly subsided to low prevalence. In February the fall was more copious, but less than half of average; cholera began to renew activity. In March the fall was excessive, more than treble average; cholera increased to epidemic prevalence. In April the fall was very light and defective; cholera increased very greatly. In May the fall was much above average; cholera ceased advancing and slightly decreased. The fall in June was heavy and above average; cholera decreased much. In July the fall was heavier, but below average; cholera continued decreasing. In August the fall was heavier again, and much above average; cholera decreased more rapidly. In September the fall was very light and defective; cholera decreased less rapidly. The fall in October was very light and only half of average; cholera decreased little. In the next two months there was no rain; cholera at first greatly increased, and then rapidly decreased.

In the Punjab the death-rate of 1881 among the troops and jails was 3.24 per mille of strength against 1.28 in 1880; among the civil population it was 0.30 per mille against 0.01, respectively. The price of food was still verging upon famine prices, though somewhat improved upon that of the preceding year. The rainfall of the year, though much more than that of the preceding, was but little below the average (see Tables Nos. II. and IIA., Punjab history section). During the first four months the falls were generally plentiful, and cholera was very little active. In May the fall was light and defective; cholera commenced activity. In the next three months the falls were all above average; cholera continued increasing, and more rapidly so with the diminishing fall in August. The fall in September was very light and only half of average; cholera increased more rapidly. In the next three months the falls were extremely light and defective, with no rain at all in November; cholera rapidly subsided and ceased altogether in December.

I have now, at the risk of prolixity and frequent repetition, followed the course of rainfall and cholera in relation to each other, through the several years of the series for which we have the statistics, in India as a whole, and also in its several provinces separately, for the purpose of showing the nature and fixity of the relation which subsists between them. The statistics, of course, represent summarised facts only, and their comparison can yield general results only. But, such as they are, we have seen that these general

results present a very remarkable and singular uniformity in the regularity of their recurrence year after year in all parts of India, and with variations in details which point to the following conclusions, viz. :—(1.) That the prevalence of the cholera of any year, in its relation to the rainfall of the same period, is not proportioned merely to the amount of the rainfall, whether that be, on the whole, in excess or in defect, but to the character of its seasonal distribution, as well as to the nature of its effects upon the soil. (2.) That this character of the seasonable distribution of the rainfall is distinguished by irregularities in the monthly amounts, producing more or less great contrasts of successive defect and excess, not during any or every season, but during seasons possessing special properties of epidemic influence arising from the effects of the previous year's rainfall upon the soil. (3.) That the nature of this effect of the rainfall upon the soil is such as to produce a condition either of drought or of saturation, or else of ordinary satiety. In this last case the soil retains its normal condition of moisture, and produces no special properties of epidemic influence. But in either of the other two conditions it is capable of doing so according to the character of the succeeding rainfall, whether this be such as by its abundance to slake drought or by its scarcity to produce drought after previous saturation; in either case giving rise to inordinate evaporation of moisture from the surface of the soil. (4.) That it is this inordinate evaporation of moisture from the surface of the soil under a more than ordinary temperature, which constitutes the principal feature in the conditions characterising a season of epidemic influence, and that it is strictly dependent for its origin upon the nature of the action of the rainfall upon the soil, which last is itself regulated by the condition of the soil upon which it falls. (5.) That in its effects upon the soil the action of rainfall, so far as concerns its relation to cholera prevalence, is especially distinguished by the greater or less rapidity of the evaporation of moisture to which it gives rise. The statistics which we have examined in detail in the preceding pages show time after time, and with very rare exceptions, throughout the series of years for which we have the records, that rainfall upon a thirsty or parched soil, if light and under an increasing temperature, or a temperature above that normal to the season, is, as a rule, attended by cholera activity, and that this activity is usually at the outset proportioned to the degree of previous drought on the one hand, and the amount of the subsequent rainfall on the other. That is to say, if light showers come upon a season of drought, and follow each other in fluctuating quantities during successive months, the attendant cholera is found to fluctuate in prevalence responsively to the rainfall. When in any month an unusually heavy rainfall occurs sufficient to suddenly and temporarily saturate the soil, and thus check evaporation from its surface, cholera is found to immediately cease its previous activity, and to abate in prevalence to a more or less marked extent. If this unusually heavy fall be followed by others sufficiently copious to maintain the established saturation, cholera continues subsiding; but if the succeeding falls be defective enough to allow of some commencing drying up, or, in other words, defective enough to give play to more or less active evaporation, cholera is found to at once renew activity and increase. This sequence of events is more distinctly observed during the hot-weather months, in which the rainfall is most abundant, and especially when it follows upon a preceding season of greater or less drought; and in some parts of India, tropical India particularly, it is as clearly observed during the cold-weather months also, more especially when they are characterised by defective rainfall following unusually abundant supplies in the preceding hot weather.

In fact, the statistics show, what observation had previously suggested, that there exists a fixed and definite relation between cholera prevalence and rainfall. They also show that—and this is what previous observation had failed to explain—this fixed and definite relation is not one dependent merely upon the amount of the rainfall, but one dependent strictly upon the nature of the rainfall as to its seasonal distribution, and upon the condition of the soil which receives it as to its state of drought or satiety. They show that drought followed by irregular scanty rainfall, alternately in excess and defect, is provocative of the activity of cholera; and that these scanty falls followed by heavier supplies, falling irregularly and in unseasonable excess and defect, produce conditions which favour the epidemic prevalence of cholera; and also, that these heavier falls followed by lighter ones in defect of the average supply, with irregular and unseasonable alternations of excess and defect, encourage renewed activity of cholera, and, with the repetition of the same sequence of events, its development into fresh epidemic prevalence. Further, the statistics show that this sequence of events, viz., drought followed by plentiful rainfall and epidemic cholera followed by abatement, has a very marked tendency to run in cycles of three years' duration, which succeed one another in regular periodic recurrence, each cycle being characterised by greatest intensity of climatic or rainfall phenomena and cholera activity in its first year, by abatement of these in the second year, and by their subsidence in the third. Also, the statistics show that the character of the cholera epidemics, coincident with the climatic phenomena by which they are produced, are very largely affected in respect to their severity and destructiveness by the health-condition of the populations amongst whom they prevail, as this condition is deteriorated or otherwise by the nature of the food-supply, it being found that dear food or famine distress prevailing concurrently with an active cholera epidemic always more or less greatly aggravates its severity, and increases the mortality caused by it.

Taking the total results of the several provinces year by year—the statistics of cholera mortality, rainfall, and food-supply in India—for the series of years dealt with in this inquiry, as exhibited at one view in Table No. III. at the head of this section, we find that for the first three years of the series the cholera death-rate among the civil populations is altogether wanting. For the year 1865 the death-rate is that only of the three provinces, Bombay, Central, and Punjab; for 1866 it is for these provinces with that of Madras added; for 1867 it is for the same provinces with the addition of Burma and the North-Western Provinces and Oudh; for 1868 the death-rate is for all these provinces with that of Berar added; for 1869 and 1870 it is for all these provinces together in each year; and for 1871 and the succeeding years of the series the death-rate is for all the nine provinces, Assam and Bengal included. The difference in the number of provinces furnishing the statistics for the earlier years from 1865 onwards does not materially affect the general results, as the death-rates are calculated upon the populations only of the provinces furnishing the data.

Looking at the figures placed in juxtaposition in the columns showing the total yearly death-rates from cholera among the troops and jail populations on the one hand, and among the civil population on the other, we find a remarkable correspondence in the cyclical periodicity of the disease. This cyclical periodicity, as has been mentioned in previous passages, is observed not only in the returns for all India, as above shown, but also in those relating to the several provinces separately, and, to a considerable extent, even in different geographical regions within their respective areas. This

periodicity in the prevalence of cholera in India is a very marked phenomenon in the behaviour of the disease, and is one which is common also to malarious fevers, so far as our obsevervation extends, although statistics in support of the statement are not producible. In the Punjab, however, the statistics of "fevers" generally have been tabulated by the sanitary commissioner for that province in his Sanitary Administration Report for 1880, together with those of the rainfall of the province; and it is there shown that, whilst a remarkable relation subsists between rainfall and fever mortality, there is also a very remarkable and coincident regularity in their periodical recurrence in mutual relation to each other, more particularly in reference to the hot-weather monsoon rains, in cycles of three years' duration. The first year of the cycle is that of maximum fever prevalence and maximum hot-weather monsoon rainfall, the second is that of medium fever prevalence and rainfall, and the third that of minimum fever prevalence and rainfall in the cycle. The first of these triennial cycles for which the statistics among the civil population of the province are available is that comprising the years 1866–68 inclusive; and the successive cycles follow in regular order, with occasional irregularities, the natural results of accidental concurrent contingencies, up to the year 1880 inclusive.

As regards cholera, precisely the same triennial periods hold good for its periodical prevalence in maximum, medium, and minimum degree in the successive years, respectively, of each three-years period. Referring to the tabular statement No. III., we find that the first triennial cycle for which the statistics are available—both for the troops and prisoners on the one hand, and for the civil population on the other—is that which embraces the years 1866–68. In this cycle cholera in India ran its normal course of maximum, medium, and minimum prevalence in the successive years, respectively, of the cycle, as is shown by the cholera death-rate of each year among the troops and jails on the one hand, and among the civil populations on the other. The rainfall of the cycle does not show a corresponding regularity of decline in its successive years, owing to an increased fall in the second year of the cycle, which also affected the fall in the third quarter—the quarter which, in most parts of India, is the period most heavily affected by the hot-weather monsoon rains. The ill effects naturally to be expected from this abnormally heavy rainfall in the second year of the cycle were, however, largely counterbalanced by its more favourable seasonal distribution, and the much cheaper rates of food in this year as compared with its less favourable seasonal distribution and the almost famine rates of the preceding. The death-rates and the rainfall of the third quarter of the successive years of the cycle, together with the steady fall in prices of the staple food-grains for the three years, are shown in contrast as follows:—

Years.	Cholera Death-Rates.		Third Quarter Rainfall.	Average Price of Food.
	Troops and Jails.	Civil Population.	Inches.	Sers.
1866	5·11	3·19	30·67	15·57
1867	4·40	1·34	33·10	19·22
1868	1·17	0·42	28·46	20·81

The figures show the rainfall highest in the second, but, as due, lowest in

the third year, and the price of the staple food-grains, in the usual course, highest in the first and lowest in the third year of the cycle.

The next triennial cycle is that embracing the years 1869–71 inclusive. The course of cholera prevalence in this cycle is marked with a regularity of abatement in its successive years quite as distinct as that in the preceding triennial cycle, although the intensity of its incidence in the cycle was much less. This diminished intensity of the cholera of this cycle was coincident with a very considerably increased third-quarter rainfall in its several years —although declining in amount in each successive year—coupled with plentiful supplies in the last quarters of 1870 and 1871, and with prices of food quite as dear during the first two years of the period as in the corresponding years of the preceding cycle. The cholera, rainfall, and food-supply statistics of the cycle are shown at one view in the following statement:—

Years.	Cholera Death-Rates.		Rainfall.	Food-Prices.
	Troops and Jails.	Civil Population.	Inches.	Sers.
1869	6·69	2·15	38·64	15·48
1870	1·68	0·75	37·72	18·37
1871	0·70	0·35	36·32	23·52

The figures show a steady and regular decline in all the three elements contrasted—cholera mortality, rainfall, and high prices—through the successive years of the cycle, the second of our series.

In the next triennial cycle, comprising the years 1872–74 inclusive, cholera in India pursued a course of activity, abatement, and subsidence in its successive years, respectively, quite as regularly as was observed to obtain in the preceding triennial cycle, although with a still diminishing degree of intensity throughout the cycle. This diminished degree of cholera intensity in the cycle 1872–74 was coincident, as the most marked feature of its concomitants, with a great and fixed cheapness of food in all its years; in neither year of this cycle did the price of the staple food-grains approach famine rates, as was the case in the first year of each of the two preceding triennial cycles. The rainfall of the last quarter in 1871, 1872, and 1873 was not unfavourable, while that of the third quarter was heavy in each year of the cycle, and in the last year abnormally so in all its quarters. The statistics for the cycle—of its cholera mortality, rainfall, and food-supply—are shown in the subjoined summary statement:—

Years.	Cholera Death-Rates.		Rainfall.	Food-Prices.
	Troops and Jails.	Civil Population.	Inches.	Sers.
1872	3·72	0·89	40·91	21·35
1873	1·55	0·51	34·81	21·31
1874	0·93	0·24	36·83	21·36

In the next triennial cycle, embracing the years 1875–77 inclusive, the regular and normal course of cholera prevalence, as illustrated by the results obtained in the three preceding triennial cycles successively, is remarkably disturbed, and, in fact, completely reversed. The first year of the cycle, instead of being the year of maximum cholera prevalence, as due in the normal

course, was the year of minimum cholera prevalence in the cycle; whilst the third year, instead of being that of the minimum prevalence in its cycle, was the year of maximum prevalence; and all through the intensity of the disease was much greater than in any of the preceding triennial cycles of our series. The rainfall of the cycle was, in the regular course, a successively diminishing fall in the third quarter of each succeeding year in the cycle, and was not more than ordinarily copious in that quarter of the year, but the falls in the fourth quarter of 1875 and 1876 were very greatly in defect. But it was otherwise with the food-supply. The prices in the first two years of the cycle were extraordinarily cheap, whilst in the third and last they were unusually dear, and this was the reverse of what obtained in the first two triennial cycles of our series. With these general facts before us, coupled with some other facts which do not appear in the tabular statement with the analysis of which we are now engaged, but which I shall presently refer to, I proceed to explain the apparent causes which in this triennial cycle operated to produce the effects above alluded to, viz., the complete reversal in the normal cyclical prevalence of cholera so far as concerns its incidence in the triennial cycle now under consideration.

It appears from the recorded statistics that the cholera in India of the triennial cycle 1875–77 actually did commence in the normal course with revived activity of the disease in the first year of the cycle, 1875, as due; but that in the second year, instead of abating from the degree of prevalence acquired in the first of the cycle, it continued to prevail with increased severity; whilst in the third year of the cycle, instead of, as normally due, subsiding into abeyance or to a minimum of prevalence in its cycle, it still further increased until it attained the maximum of intensity of the cycle in this its third year. The cause of the increased severity of the disease in 1876, in place of the normally due declining severity, was the drought in the last quarter of 1875 and first quarter of 1876, followed by excessive monsoon rains, and aided by the famine, &c., the famine in Madras, and the greatly increased death-rate from cholera in that year resulting therefrom; and precisely the same cause in a still more greatly aggravated degree, viz., drought in the last quarter of 1876 and defective rainfall throughout 1877, together with increased famine distress, operated to raise the general death-rate from cholera in 1877, the last year of the triennial cycle. In Madras the cholera death-rate among the civil population in 1876 was 5.08 per mille, with the annual average price of the staple food-grain at 21.22 sers the rupee; but in 1877 it rose to 12.24 per mille, with the staple food-grain at 11.32 sers the rupee as its annual average price.

These facts fully account for the reversal of the normal regularity in the course of the cholera of this cycle. The statistics for the several years of the cycle, as regards cholera prevalence, rainfall, and food-supply, are shown in the following abstract statement:—

Years.	Cholera Death-Rates.		Rainfall.	Food-Prices.
	Troops and Jails.	Civil Population.	Inches.	Sers.
1875	2·32	2·10	40·33	24·52
1876	2·89	2·32	35·52	24·34
1877	3·99	3·39	32·61	17·00

The figures show a regularity in the decline of the rainfall of the third

quarter in the successive years according to the normal course, but a reversal of the regular course as normally due in respect to cholera mortality and prices of food, thus illustrating very forcibly the relation existing between cholera prevalence and the health standard of its subjects as affected by the food-supply.

In the next and last triennial cycle of our series, comprising the years 1878–80 inclusive, cholera in India returned to its normal course of periodical prevalence and decline with a regularity equal to that displayed by the deportment of the disease in each of the first three triennial cycles out of the five comprised in our series of twenty years for which we have complete statistics inclusive of the civil population. The intensity of the cholera of this cycle, however, was very markedly less than that of the preceding; and this was the case notwitstanding a great increase in the dearness of food and widespread famine distress during the first two years of the cycle in the southern peninsula and Bengal generally, and was due to the favourable nature of the rainfall in the fourth quarter of the years 1877, 1878, and 1879. Coincident with this prolonged dearness of food and a great defect in the rainfall of the first quarter of 1879, we find a corresponding prolongation of the intensity of the cholera prevalence, whereby the death-rates for the two years were very much on a par, instead of being, as due in the normal course, markedly less in the second year of the cycle; whilst in the third year, with a more favourable distribution of the seasonal rainfall, and with the return of cheaper rates of food, the death-rate fell to the level normal to that year of the triennial cycle. The third-quarter rainfall of the cycle was, in the normal course, a diminishing fall in each successive year of the cycle; but the third-quarter falls of the first two years were more than usually copious, and, as stated, were attended by quite exceptionally high prices for food in both years in all the provinces of Southern India and Bengal generally. The statistics of the cycle in respect to cholera mortality, rainfall (third quarter), and food-supply are shown in the following abstract form:—

Years.	Cholera Death-Rates.		Rainfall.	Food-Supply.
	Troops and Jails.	Civil Population.	Inches.	Sers.
1878	4·10	1·63	42·14	13·02
1879	3·09	1·44	39·66	14·16
1880	1·27	0·64	34·24	21·28

The figures show a uniform decline in all the three elements compared through the successive years of the cycle, and well illustrate the relation between cholera intensity and food distress by the very marked coincidence of high death-rates and high food-prices in the first two years of the cycle.

We thus find that, out of the five successive triennial cycles above analysed, and for which we have the statistics available for both the troops and prisoners, and for the civil population, in all, except one, the course of cholera prevalence, rainfall, and food-supply has followed, in respect to each element severally, a regular and periodically recurring order of maximum, medium, and minimum degrees of incidence in the successive years, respectively, of each triennial cycle, notwithstanding slight variations in the gradations of decline from the higher to the lower degrees of incidence in

the different cycles. The irregularities in the normal course of cholera in the exceptional cycle, as already stated and explained, were the result of irregularity in the seasonal distribution of the rainfall, and of unprecedentedly severe famine distress in the Madras Province during the two last years of that cycle—1875-77.

Besides the five triennial cycles above dealt with, there is a sixth included within our series of twenty years. It embraces the years 1863–65 inclusive, and heads the list of triennial cycles comprised within the period over which our inquiry extends; but our statistics regarding its cholera prevalence are defective in respect to the incidence of the disease among the civil populations during the first two years of the cycle. Apart from this defect, however, the statistics, as far as they go, and supported by the experience of subsequent years, contain sufficient evidence to show that the normal course of cholera prevalence in this cycle was thrown out of its regular order in at least the last year of the cycle; and this irregularity in the incidence of the cholera of the cycle was coincident with a corresponding irregularity in the rainfall and food-supply during its third or terminal year. Taking the cholera death-rate among the troops and prisoners, we find that the first year of the cycle, 1863, as due in the normal course, was a year of revived cholera activity, the death-rate being considerably higher than that of the year before—the last of the preceding triennial cycle. The price of food in this year, however, although considerably dearer than in the year before, was remarkably and, so far as subsequent statistics show, exceptionally cheap for this the first year of the triennial cycle. The rainfall of the year—the third-quarter fall—was, in the normal course, the maximum fall of the cycle, but it followed very great defect in the first quarter. In the next or second year of the cycle, with a favourable seasonal distribution of the rainfall, the cholera death-rate, as normally due, was less than that of the preceding year in the cycle, as also was the third-quarter rainfall; but the price of food, although still comparatively cheap, was, contrary to the normal course, considerably dearer than in the preceding year. In the third or last year of the cycle, again, this irregularity in the course of the rates for food was even more marked, and prices rose so high as to approach famine rates. Coincidently with this high price of food, the cholera death-rate of the year was markedly higher than that of the preceding, and instead of, as normally due, sinking to the minimum rate in this third year of the cycle, rose to a level with that of the first, or year of maximum death-rate in the cycle. The third-quarter rainfall of the year was, at the same time, more than that of the same period in the year before, instead of, as due in the normal course, being less, and it followed upon defective falls in the three preceding quarters. The statistics of cholera, rainfall, and food-supply in this cycle are shown in the following abstract form:—

Years.	Cholera Death-Rates.		Rainfall.	Food-Supply.
	Troops and Jails.	Civil Population.	Inches.	Sers.
1863	6·44	?	33·19	25·16
1864	4·65	?	30·19	21·33
1865	6·30	8·19	31·67	17·11

The figures show a normal sequence of events as respects cholera incidence and rainfall in the first two years of the cycle, and an abnormal increase in the incidence of both in its third year; but in respect to food-supply they show a complete reversal of the normal course of prices, the highest rates being in the third instead of in the first year of the cycle. The coincidence of the irregularity in the course of cholera incidence and that of food-prices in the third year of the cycle is very marked, and, coupled with the experience of subsequent cycles, suggests the relation of cause and effect.

If we take the corresponding statistics for the several provinces separately, we obtain the same general results in respect to periodicity in the rise and fall of cholera incidence, rainfall, and food-supply. These statistics are shown in the separate series of tabular statements for the several provinces in succession, and they are worthy of a careful examination.

SECTION XII.

DEDUCTIONS DRAWN FROM THE RESULTS OF THE PRECEDING HISTORY OF CHOLERA IN INDIA FROM 1862 *TO* 1881,

TOGETHER WITH PRACTICAL OBSERVATIONS REGARDING THE NATURE AND CAUSES OF CHOLERA.

In the preceding pages I have brought together in summarised form the main facts of a statistical nature concerning cholera in India during the twenty years ending 1881, so far as they have been recorded in the official reports of the several provinces under British administration; and with them have been combined, so far as has been found available, the recorded statistics relating to the rainfall and food-supply, as indications of the climatic conditions and health-circumstances of the people, characteristic of the several years of the series dealt with in this inquiry. For the records, so far as they go, show that cholera in India is a disease which, in point of prevalence, is very intimately related to, and dependent upon, the climatic and seasonal influences of the country, and that the effects of these influences, as manifested in the prevalence and fatality of the disease, are in a very remarkable manner modified and controlled by conditions of locality affecting the soil, the weather, and the life-circumstances of the people.

To enter into a detailed examination of the facts recorded, and to compare the results obtained in the several provinces, as well as in different localities within their respective areas, with one another, in order to illustrate the laws which control the development and deportment of epidemics of cholera in contradistinction to the sporadic prevalence of the disease, is a task requiring time and careful study. But as neither the time nor the leisure for this very important work is at present available, all that I can do in this place is to describe in the briefest and most general terms the main features in the characteristics of soil, climate, and health-conditions, in their relation to the prevalence, or the reverse, of cholera in India, so far as they have presented themselves to me as disclosed by the facts recorded in the preceding pages. For the rest, I must leave the mass of statistical and descriptive information brought together in one view in this "History of Cholera in India during the Twenty Years 1862–1881" for study and examination, and comparison with the course pursued by other allied diseases in India, to more competent heads, and to students who can come to the task with unfettered leisure.

So far as they go, the records brought together in these pages, embracing as they do the whole extent of the continent of India under British administration, show very clearly that certain regions and tracts of country in India, which bear a striking general similarity of resemblance in respect to the main features of their physical aspects and climatic characteristics, are much more favourable to the development of the epidemic activity of cholera

than are other regions and tracts of country in India which differ from them very essentially in the characteristic features of their physiography and meteorology, as well also as in point of density of population, and the condition of the material prosperity of that population.

In the former class of regions or tracts of country cholera is found to be more or less always active at all times and seasons, and is consequently—although subject to regularly recurring periods of epidemic intensity—considered to be an endemic disease in such regions or tracts of country. In the other class of regions or tracts of country cholera is not found to be always active at all times and seasons. On the contrary, in these areas it prevails only in seasons of periodically recurring general epidemic diffusion of the disease, and consequently cholera in these regions and tracts of country is considered to be only an occasional visitor and an epidemic disease.

The distinguishing features of the two classes of country thus contrasted are these:—

In the first, or endemic, areas of cholera the main features of the physical geography are characterised by a low-lying alluvial soil, which is more or less supersaturated with ground-water in a state of stagnation or but comparatively very slight motion, and which is subject to periodical inundations or waterlogging by the seasonal floodings of the great rivers by which those areas are traversed in deltaic formation. These characteristic features of the physical aspects of the endemic areas of cholera are coupled with equally striking features characteristic of their climatic conditions, namely, with those of a moist and hot tropical or sub-tropical climate; and they are, moreover, with the exception of Burma, among the most densely populated parts of the country. Examples of such areas in Bengal and Assam are the great river deltas of the Ganges and Brahmaputra, of the Mahánadi in Orissa, and the interfluvial tracts of Behar. Similar examples—though perhaps differing somewhat in the geological character of the soil—are afforded in Burma by the great deltas of the Irrawady and Salwin, and in Madras by those of the Godaveri, the Kistna, and the Kaveri. All these deltaic areas are situate within the tropic of Cancer, and are characterised by a hot and humid climate. In Bombay, the deltas of the Narbada, and, in the extreme north, of the Indus also, afford examples of great alluvial terrains of a generally similar nature; but they differ from the corresponding deltas of Bengal, Burma, and Madras in the very important element of climate, which here—more especially in the delta of the Indus (which is beyond the influence of the rainy monsoon of the hot weather, at least when it pursues its ordinary course)—is extra-tropical, and presents the very opposite features of that which characterises the deltas of Bengal, Burma, and Madras, namely, aridity instead of humidity, and a temperature varied by excessive heat in summer and by a season of real cold weather in winter. With this difference of climate, these deltas—that of the Indus especially—are not endemic areas of cholera. In the southern portion of the Bombay seaboard, however, as on the Konkan and Malabar coasts, the littoral assimilates in physical characteristics both of soil and climate to the great deltaic areas of Bengal and Madras; and we find that these tracts also are more or less strictly endemic areas of cholera.

In the Berar and Central Provinces, together with the great Deccan tableland occupying the body of the southern peninsula between Bombay and Madras, there are no such great waterlogged alluvial tracts as those above referred to in the provinces before mentioned; whilst there is an equally marked difference in their climate, which may be considered as intermediate

between that of Sind on the one hand and of Bengal on the other, partaking of the characteristics of the former in the cold weather and spring months, and of the latter in the hot-weather monsoon season and autumn months. In these territories we find no strictly endemic areas of cholera. But in the North-Western Provinces and Oudh we find, in the area of the convergence towards the Ganges of the several great rivers by which those provinces are watered, a state of country which bears many points of resemblance to the deltaic regions of Bengal; in conjunction, too, with a climate partaking of both tropical and extra-tropical characteristics—the climate of the southern half of the region assimilating to that of Bengal, and of the northern half to that of the Punjab. In the former extensive tract of country, which includes Oudh and the southern Gangetic districts of the North-Western Provinces as far up as Allahabad, the characteristic features of the physical geography are an alluvial plain and a soil more or less highly saturated with ground-water, the sub-soil level of which is comparatively close to the surface, as is evidenced by the general use of lever wells for purposes of field-irrigation. Its climate, also, bears some resemblance to that of the adjoining portion of Bengal, more especially during the season of the hot-weather monsoon rains. Its population, too, is quite as densely massed, if it is not also quite as poverty-stricken, as that of Bengal, adjoining to it. In this southern half of these provinces cholera is considered to be an endemic disease because of its persistent presence at all times and seasons. In the latter, or northern half of these territories, whilst the physical aspect of the plain country differs little from that of the corresponding part of the southern half, the climate presents some marked differences, with a generally less humid atmosphere and a decidedly colder winter season, whilst its population is decidedly less densely massed, and enjoys also a better condition of material prosperity than that in the southern half. In this portion, also, cholera is found to be an endemic disease, although to a less extent than in the southern half.

In the Punjab, as in the Berar and Central Provinces, we find no great alluvial tracts corresponding to those of the Gangetic river-basin, nor similarly affected by fluviatile agencies. The hydrographic system of the Punjab centres in the Indus, and the confluence of its great contributaries and their lesser affluents is effected without the production of any great areas of low-lying waterlogged alluvium in conjunction with a comparatively humid and hot climate, as is the case in the North-Western Provinces and Oudh, since the rivers, in their course obliquely across its great plain, are separated by great dorsal ridges of more or less entirely arid tablelands which very clearly define the lowland strips of the several river valleys. These lowland strips are subject more or less to inundation from their respective rivers in the flood season, and are generally at all times more or less saturated with ground-water by percolation from their streams. But the climate, being clearly extra-tropical, is so unusually dry, owing to the vast area covered by thirsty deserts and arid tablelands within the limits of the province and beyond its southern borders, that the natural humidity of these lowland strips is quite lost in the general aridity around. Nevertheless there are some tracts in the Punjab which bear a close resemblance to some parts of Bengal and the North-Western Provinces in respect to the relatively low level of the land and the supersaturation of its surface-soil with ground-water, as well as in respect to climate during the season of the hot-weather monsoon rains, but during this season only. Such tracts are found in the Gurgaon, Delhi, and Karnal districts between the diverging Jumna and Sutlej Rivers; in the Kangra, Gurdaspur, and Amritsar districts between the converging Beas and Ravi

Rivers; also in the Hoshiarpur and Jullundur districts of the Beas and Sutlej interfluvial tract. In the Peshawar district is another extensive waterlogged tract, occupying the whole area of the basin in which the Kabul and Swat Rivers meet after issuing from the hills. All these tracts in the Punjab are favourite haunts of cholera both in epidemic and ordinary seasons, and the disease is sometimes so mixed up with the endemic malarious fevers of the tracts as to be undistinguishable from the more prevalent fevers.

Such, in brief terms, are the characteristic features and the chief localities of the areas of the principal prevalence of cholera as an endemic disease in India. They all possess the elements favourable, under certain conditions, to rapidity and activity of evaporation from the surface-soil, with its consequent sudden changes of temperature and atmospheric humidity and resultant production of damp chills, especially by dewfall at night. The conditions most favourable to increased activity of evaporation from the surface-soil occur at the times and seasons when the surface-soil is at its comparatively lowest point of saturation with ground-water; that is to say, when it is only in a slightly moist state. All experience teaches that evaporation is much more rapid and active in its effects when from a merely moistened body than when from a thoroughly soaked body. And it is this fact which explains the difference, to be presently noticed, between the seasonal prevalence of cholera in areas naturally waterlogged or supersaturated with moisture during certain periods of the year, and in areas only periodically moistened in respect to their surface-soil.

In the second, or epidemic, regions of cholera before mentioned there are no such precisely definable features of soil and climate habitually presented. On the contrary, these regions present every sort of physical aspect other than those above described as distinguishing the endemic areas of the disease; whilst over very extensive tracts of their several territories the population is very sparse, though usually prosperous. They are, at the same time, distinguished by a very different character of climate from that experienced in the endemic areas, and also as being only occasionally affected by cholera, in the due course of the periodical epidemic manifestations of the disease. And this course of periodical activity of cholera in these epidemic regions, as distinguished from the endemic regions, brings us to the consideration of the most striking peculiarity in the deportment of the disease in India, namely, its regularly recurring seasonal development of activity, with intervals of abatement or absolute quiescence. This seasonal development of cholera activity is shown, by the records produced in the preceding pages, to be observed as a regularly recurring phenomenon not only in the epidemic areas of the disease, but in its endemic areas also.

The records of cholera mortality in the several provinces show that the disease has its regular seasons of activity and of quiescence in alternation, not only in every year, but also in every cycle of years. This cycle is, as the records concurrently and consecutively show, one of three years, both for the several provinces taken separately and for all India taken as a whole; whilst in many instances this cyclic recurrence of cholera activity is observed to hold good for separate areas in the several provinces also. In the annual alternations of rise and fall in cholera prevalence it is observed, as a regularly recurring phenomenon of the disease, that the periods of the vernal and autumnal equinoxes are the seasons of its absolute inactivity or minimum degrees of prevalence, even in the course of an epidemic; and that the months intervening between these and the northern, or summer, and the southern, or winter, solstices, respectively, are the seasons of its habitual

activity or maximum degree of intensity, whether in ordinary course or in the course of an epidemic career. In this regularity of sequence considerable variation is observable according to the geographical positions and physical conditions of the regions or localities habitually affected by the disease, and most especially according to the climatic phenomena of their normal seasons. Nevertheless the regularity is real and fixed both for the endemic (or tropical) and for the epidemic (or extra-tropical) areas of cholera prevalence. The difference amounts only to one of proportion, according, primarily, to the severity or mildness of the epidemic season, and according, secondarily, as the regions or localities affected are, by the conditions of soil, climate, and health-circumstances of the people, favourable or unfavourable to the development of the activity of cholera.

That is to say, whatever be the conditions of the regions or localities affected by cholera in respect to the points mentioned, the disease never, as a rule, breaks out in them in epidemic prevalence except in its proper natural season for such activity, and then always as a part of a great generally diffused manifestation of the activity of the disease over a region or province subject to the prevailing climatic influences of the season, which climatic influences themselves depend for their production upon the nature of the preceding and concurrent distribution of the seasonal rainfall. But it occasionally occurs that, under circumstances which favour its continuance, an epidemic prevalence of cholera, which has commenced in its normal course and proper season for such activity, may be, and not infrequently is, prolonged into the succeeding season, which, under the ordinary circumstances, or normal conditions, is that of its natural quiescence, or of its usually minimum prevalence. Still, even in such instances of unduly prolonged prevalence the tendency of the disease is very markedly towards abatement or complete subsidence before the arrival, in due course, of the next season for its normal manifestation of activity. And then, if the conditions continue favourable to the epidemic prevalence of the disease, cholera again breaks out with revived force, and continues to prevail with greater or less severity until the approach of the next season for its natural abatement or normal quiescence, when it again markedly declines in activity, or, in the event of the cessation of the collateral circumstances favourable to its continued prevalence, ceases its activity altogether. The collateral circumstances which experience has proved to be favourable to the continued prevalence of a naturally developed seasonal epidemic of cholera are—

(*a.*) Certain conditions of climate or weather, characterised in the main by an abnormal excess of atmospheric humidity and temperature, coupled with some ill-understood, but nevertheless very plainly perceived, changes in the electric condition of the air and the amount of its present ozone.

(*b.*) Certain conditions of the soil favouring sudden and unduly active evaporation of moisture from its surface—as in normally waterlogged or submerged areas when the excess of water is drained away and the soil begins to dry; and as in normally arid areas when rainfall moistens the parched surface; and as, in both cases, when seasons of unusual drought are followed by copious rainfall, or are attended by periods of humidity of the atmosphere without rainfall, but with unusually high temperature.

(*c.*) Certain conditions of the life-circumstances of the people, characterised mainly by an abnormal reduction of the general health standard produced by either defect in food-supply or by unusual exposure to fatigues, privations, and vicissitudes of weather—as in the case of troops in the field or masses of the population on pilgrimage—which by accident may happen

to be coincident with the normal seasonal activity of the disease, or which may be prolonged into the succeeding season of its normal abatement or quiescence.

It is the concurrent existence of these contingent or collateral circumstances, claimed to be favourable to the extraordinary development of a naturally prevalent cholera, which has from time to time, in widely distant parts of India, prolonged, intensified, and very largely extended the violence and diffusion of the normal seasonal manifestations of the disease—manifestations which otherwise, we are justified, from the normal deportment of cholera, in concluding would not have exceeded the bounds of the ordinary seasonal prevalence. Further, as these contingent or collateral circumstances are found—a fact which is abundantly illustrated in the records of the preceding pages—to influence the seasonal regularity of cholera in the course of its yearly manifestations of alternating activity and quiescence, so are they found also to influence and control the phenomena of the cyclical prevalence of the disease, although not to the extent of destroying or completely obliterating that cyclical periodicity.

The statistics which have been produced in the preceding pages from the recorded deportment of cholera in the several provinces of India during the series of twenty years ending 1881 show very clearly that the disease is governed in its manifestations of activity by a law which runs for three years in the several provinces, as well as in the distinct areas of the several provinces affected by cholera. The series of twenty years dealt with in this inquiry, as is shown by the statistics (despite their imperfections and incompleteness for several years of the series, so far as relates to the general civil populations), comprises six complete successive triennial cycles, and commencing with the terminal year of a seventh, concludes with the initial year of an eighth. These triennial cycles are shown by the statistical returns to be natural periods, successively following one upon the other, of cholera activity, abatement, and subsidence in more or less regularly recurring orderly sequence, but with very varying degrees of intensity not only in the different cycles, but in their component years as well. Of the precise conditions producing these varying degrees of intensity of prevalence of cholera, the statistics available do not afford sufficient data for the expression of any definite explanation, beyond the general statement that the severer epidemic outbreaks of cholera which have been recorded as occurring from time to time in different parts of the Indian continent appear to have taken place during seasons of drought and famine, and to have been more or less seriously aggravated during the first falls of the long-withheld rain; whilst as the rainfall increased, and both soil and air became supersaturated with moisture, the activity of the disease has always markedly abated, but sank into subsidence with varying degrees of rapidity, generally in strict relation with the nature of the rainfall. A striking feature in the seasonal prevalence of the disease in some provinces is the regularity of its summer and winter accessions of activity, and occasionally the prolonged continuance of these seasonal periods of activity with increasing intensity during great epidemics which are concurrent with drought and famine. The subject is one requiring careful inquiry and further elucidation by study of the statistics produced in these pages.

Regarding these statistics, it is necessary to bear in mind that they are not all of equal value in point of accuracy. Those relating to the troops and jail populations are far more authentic and accurate than those relating to the general civil populations of the great territorial regions included in this

inquiry. Mainly, the latter figures are valuable as an index to the several localities affected by cholera, to the relative extent to which the disease prevailed amongst the populations of these localities, and to the seasons of its habitual activity or quiescence. The more accurate records relating to the troops and jails afford a means of gauging the actual death-rate of cholera among the general civil populations, among whom the returns of death registration are confessedly very imperfect in respect to enumeration, and to some extent defective also in point of diagnostic accuracy. This latter defect, however, is by no means of so great magnitude as is by some considered to be the case. Cholera, as it has been defined in an early part of this history, is a disease marked by such prominent symptoms, and is besides so well known to the people of the country, that there is little chance of its being confounded with any other disease, except, perhaps, on occasions of its epidemic prevalence concurrently with epidemic fever of a type presenting symptoms undistinguishable in many cases from those of cholera itself, or on occasions of the concurrent prevalence of epidemic cholera and famine diseases, when the colliquative diarrhœa of the latter may be sometimes mistaken for cholera. The defect in accuracy of diagnosis, moreover, is not altogether confined to the returns relating to the general civil populations. It exists also, to a greater or less extent, in those referring to the troops and jail populations, as a result of the diversity of opinion among medical men as to what symptoms constitute genuine cholera. In this respect, therefore, there is little difference in the value of the returns for the different classes alluded to. The great difference between them lies in the vastly more complete enumeration attained in the returns relating to the troops and jails than in those relating to the general civil populations; and hence the death-rates obtaining among the former classes, making due allowance for their being all, or almost all, adult males, may be used as a guide to the true death-rates of the disease among the latter classes; but with this reservation, viz., that the statistics relating to the European troops and to the jail populations refer to bodies of men who, from the special circumstances of their being grouped together respectively under conditions which, as will be mentioned hereafter in a later passage, are not always the most favourable in point of shelter from weather influences, are peculiarly liable to attack from the disease when it is abroad in epidemic form. For this reason the cholera death-rates among the Native troops, who are differently circumstanced in these respects—that is, more favourably in point of shelter from weather influences—afford a better and more correct guide to the incidence of the disease among the general civil populations. One great value of the provincial returns is, that their indications enable us to determine the areas of country in which cholera is either endemic or of frequent occurrence, as well as those in which it is only occasionally experienced in seasons of general epidemic prevalence, or is entirely unknown; and this notwithstanding the fact that the deaths registered from cholera afford no clue to the actual or even approximate number of individuals attacked by the disease, nor indeed an accurate index to the actual mortality caused by cholera. These results are due to the fact that cholera is rarely recognised or acknowledged as such until some case ends fatally with suddenness and violence of symptoms, or until the disease breaks out into epidemic activity; and even then the milder attacks—although they may prove fatal—occurring at the same time and in the same locality are rarely if ever recognised as in any way connected therewith. In fact, the malady which is produced by the cholera influence is not sufficiently recognised as cholera, either by the profession or by laymen, until or unless it manifests the grave

symptoms characteristic of the last and most fatal stage of the severer forms frequently assumed by the disease; whereas, as a matter of fact, and more especially in seasons of its epidemic prevalence, cholera affects, in a mild or moderate degree of severity, a vastly greater number than it kills by the violence of its assaults. From these remarks it must not be concluded that the general registration of cholera deaths in the several provinces is altogether incorrect or unreliable. On the contrary, the internal evidence of the returns themselves—especially in respect to the seasonal rise and fall in the prevalence of the disease, and the periodical growth and decay of epidemic outbreaks—and the comparison of their results with those afforded by the army and jail returns, which are recognised as generally exact and trustworthy, tend to show that the registration of deaths among the civil populations, although still in need of much improvement, is nevertheless approximately correct, more particularly in the case of cholera as defined by the well-marked and prominent symptoms described in an earlier page.

The records, however, so far as they go, show that cholera in India is a disease which, in point of prevalence, is very intimately related to and dependent upon the climatic and seasonal influences of the country, both as a whole and as made up of constituent parts.

And, further, that the effects of these climatic and seasonal influences, as manifested by the prevalence and fatality of the disease, are in a very remarkable manner modified and controlled by conditions of locality affecting the soil, the weather, and the life-circumstances of the people.

The records show very clearly that cholera in India has a three-year cycle in which it successively bursts out into activity, then abates, and finally subsides into quiescence. This successive course in the cyclical prevalence of the disease is clearly shown not only in the mortality returns for each of the provinces, but usually in those also relating to their constituent districts. In some contiguous provinces this cycle of three years covers identical years common to the provinces or regions of country so situated. In other provinces or regions of country more widely separated by geographical position, though not always by character of physical condition, this triennial cycle does not cover the identical years common to the other regions or provinces, but it includes one or more of their cycle years. The variation, however, is no greater than might be expected as the consequence of difference in geographical position or latitude, which in India has a great deal to do with the earlier or later seasonal manifestations of cholera activity, and, as a matter of fact, does not materially affect the general results derived from the tabulation of the cholera statistics of India treated as a whole.

These statistics, whether taken for the provinces separately or for the whole of India collectively, show the same general results, namely, a remarkable uniformity in the triennial cyclical periodicity of cholera prevalence. The first of the three-year period is that of epidemic cholera prevalence in greater or less severity, the second year is that of abating prevalence, and the third is that of minimum prevalence or of absolute abeyance. And this, with few exceptions, which are intelligibly accounted for by the nature of the concurrent contingent circumstances—mostly of an accidental kind—is the general and established rule for the prevalence of cholera in India, as determined by the statistics available.

Such, briefly, are the general results presented by the statistics of cholera in India both for the annual and for the triennial periods of its manifestations of activity, and this for the provincial areas separately or for their combination as a whole representative of India as a single and integral

quantity. Descending to details, and taking separate localities or areas in the several provinces, we find a very striking uniformity in the results of the recorded statistics, varied only by such anomalies and irregularities as to time and severity as are easily to be understood in consideration of latitude, geographical position, season, life-conditions, and other strictly local accessories affecting the soil, the air, and the public health.

That is to say, in local manifestations of cholera, as part of a generally diffused provincial prevalence of the disease, we find nothing more than was to be expected from the known peculiarities in the deportment of the malady —such as its recognised partiality for particular spots or places, its sudden outburst into activity and equally sudden subsidence into quiescence, and, as is not infrequently observed to be the case, its tenacity upon a particular community. These local manifestations of cholera activity are not always simultaneous in their occurrence within the defined areas of districts or tracts of country affected by the disease; nor are the local outbreaks generally distributed over the area of the affected districts. On the contrary, a considerable diversity is observable in these respects. Nevertheless they are always, as a general rule, confined within the periods of the normal seasonal prevalence of the disease; and although they may, and sometimes do, by their incidence in point of time, somewhat mar the regularity of the course of the seasonal prevalence of cholera in such limited areas, they do not materially affect the general results as regards the regularity of the seasonal prevalence of the disease for the larger area, region, or province of which such affected districts form a component part.

Indeed, the vagaries observed in the deportment of cholera within limited areas of a given region or province are no greater than is observed to obtain in respect to vicissitudes of weather within the limits of similar restricted areas of a given region or province. That is to say, that whilst the general weather characteristics of a region or province are marked by uniform similarity of features, there are great variations and divergencies from the normal type in the different areas and localities of limited extent which constitute such region or province. In fact, there is a strongly marked analogy observable between the phenomena of cholera activity and those of weather activity when compared together with reference to their respective behaviour; and this as well for the whole area of any given region or province in India as for the limited areas of its component parts or districts. For instance, in seasons of epidemic cholera prevalence, whether of the summer or of the winter, we find that a region or province is covered with the influence which produces cholera, in the manner of a generally diffused agent, but that the influence or agent manifests its activity by the production of cholera in a very irregular manner as regards sequence of time and locality within the limits of that season and region or province of epidemic cholera prevalence. Sometimes the disease is found overspreading whole districts and leaving others, may be between them, entirely untouched, and sometimes it is found affecting only a few places at widely distant intervals; whilst, in point of time, the disease is frequently observed to make its first appearance simultaneously in widely distant parts, and may be, opposite extremes, of a region or province, and afterwards to show itself in the intervening tracts with a more orderly course of progress from place to place with the weather, but still with many anomalies and irregularities corresponding to the vicissitudes of the weather. This relation between weather and cholera is well illustrated by the regularly observed deportment of the disease in the Madras Province, where the spring and

summer cholera always moves from south to north with the advancing southerly monsoon, whilst the autumn and winter cholera always travels from north to south with the receding northerly monsoon. Similarly, in the natural seasons of the year corresponding with those of epidemic cholera prevalence, whether of the summer monsoon or of the winter monsoon, we find that a region or province is covered by the climatic influences peculiar to the season in the manner of a generally diffused agent, but that the action of these influences is very varied and unequal in different parts of the region so covered, within the limits natural to that season, in point of time and in respect to sphere of influence. Sometimes the weather proper to the season is found to recur with normal regularity over the areas of some districts, and to fail more or less extensively in other districts; sometimes the season is found to forestall its usual time of recurrence in widely distant parts, and, may be, at opposite extremes, of a region or province, and to fall late in recurrence in the intermediate parts; sometimes, again, the irregularities of the seasonal weather are so great that the season is said to have completely failed in some parts, to have been average in others, and excessive or the reverse in others again.

In endeavouring to trace out the analogy here referred to between the phenomena of cholera prevalence and those of season recurrence in India, there are some points which attract prominent attention and afford a wide field for investigation. The principal of these are—(1.) periodicity in the recurrence of the same regular phenomena of weather within the limits of their proper seasons; (2.) the variation of these seasons, in point of time, according to latitude or geographical position; (3.) the divergencies of successive annual seasons from the normal standard of their respective phenomena in particular tracts of country or particular localities, whether resulting from purely meteorological influences, or from the operation of local physical features of soil and country; and (4.) abnormalities of the general meteorology of the year, resulting from causes operating or originating outside the limits of the country itself, but affecting the life-conditions of the people of the country, as by drought or famine.

On all these points, and the nature of their relations to the corresponding phenomena of seasonal cholera recurrence, our information has hitherto been, and to some extent still is, extremely defective, and consequently useless for any practical application in respect to the supposed or asserted relation that exists between weather phenomena and cholera activity. At the same time, the records of the observed phenomena of weather during periods of cholera prevalence afford evidence of the existence of an undoubted relation between the meteorology of a place and its liability to cholera activity. The exact nature of this relation has never yet been determined, and in the meantime any explanation of the phenomena of weather and the prevalence of cholera in the relation of cause and effect can only be accepted on its own merits.

So far as has been recorded, the evidence regarding the nature of the weather which has been observed to prevail at times and places of epidemic cholera prevalence is generally corroborative of the existence at such times and places of certain salient characteristics of climate, which may be defined in the abstract as possessing the following principal features:—(1.) An unusually high day temperature; (2.) an excess in the normal humidity of the atmosphere; (3.) a more or less complete stagnation of the air; (4.) a general state of the weather, variously described as "muggy," "oppressive," "sultry," "depressing," "enervating," &c., and commonly supposed to

be the result of absence of ozone and electricity from the air; and (5.)—the most important of all—a more or less unusually great range in the diurnal temperature, that is, between the temperature of the air in the day-time and of that in the night-time; together with suddenly occurring more or less great falls in temperature. The intensity and degree of persistence of these characteristic phenomena of "cholera weather" vary very remarkably in different parts of India. Yet they are everywhere present where cholera prevails in epidemic form, although affected very largely by the operation of special conditions of locality and climate, as well as of geographical position. Indeed, to be properly understood, the relation between weather phenomena and cholera prevalence must be considered as a comparative relation controlled and influenced by conditions of locality in respect to soil, climate, and life-circumstances of the people, or more properly of the individual. Considered from this point of view, we may be able to explain intelligibly what are the causes in operation which produce seemingly diametrically opposite results in the observed relations, in point of concurrence between weather phenomena and cholera prevalence, in different geographical areas of the Indian continent—in areas which differ from each other not only in respect to their distinct climatic regions, but also in respect to their physical aspects of geography; as, for instance, in the great low-lying alluvial waterlogged deltaic areas of Bengal, Burma, and Madras on the one hand, and in the great more or less elevated and comparatively arid alluvial plains of the Punjab and adjoining portions of the North-Western Provinces on the other, or in the somewhat similarly circumstanced—in point of aridity—tablelands and plateaux of the Deccan and Central India, or even in the arid alluvial delta of the Indus. We may thus be able to reduce the nature of the relation between weather and cholera prevalence to a common and fixed standard of cause and effect.

It is clearly established by the statistics of cholera in India which I have brought together in the preceding pages—(1.) that in the areas of Bengal, Burma, Madras, and Bombay—the deltaic areas—which are characterised by a soil supersaturated with moisture and a climate distinguished for its heat and humidity, the periods most favourable to the prevalence of cholera, whether in epidemic or sporadic form, are the months immediately preceding and following the hot-weather monsoon rains, namely, April and May, and November and December, respectively; and that the period of the hot-weather rainy season itself, provided the rains be in plentiful supply, is inimical to the manifestation of cholera activity in any great intensity of epidemic form; and (2.) that in the elevated and drier areas, both as to soil and climate, of the provinces above named, as also in the areas of generally similar character, in respect to the absence or deficiency of soil moisture and atmospheric humidity, which constitute the bulk of the territories of the Deccan, Berar, and Central Provinces, of the North-Western Provinces and Oudh, and of the Punjab, the periods most favourable to the prevalence of cholera are the months of the hot-weather rainy season itself, namely, the months from June to October inclusive. But—and this is a noteworthy fact—it is in the month of April, or towards the end of March (the period at which the most sudden and greatest rise occurs in temperature from that of the winter cold to that of the summer heat), that cholera in this class of regions first starts into activity for each year's career, and this in all parts of India irrespective of local conditions or geographical position, as well as of the character of the cholera of the year in respect to intensity of prevalence.

Expressed in other words, the difference above described amounts to

this, namely—(1.) that in the areas possessing an habitually moist soil and hot humid atmosphere, the periods of cholera activity are the natural periods of most active evaporation, and consequently of greatest and most sudden changes of day and night temperature, combined with alternately heated and chilled vapour in the air; and these as results of the subsidence of the periodical river inundations and drying up of the monsoon flooded land; and (2.) that in the areas possessing an habitually dry soil and arid atmosphere the periods of cholera activity are also the natural periods of most active evaporation, and consequently of greatest and most sudden changes of day and night temperature, combined with alternately heated and chilled vapour in the air; and these as the results of a rapid drying up upon a thirsty soil suffering from drought, of periodical discharges of rain and flood-waters in more or less greatly excessive quantity over the average monthly rainfall of those areas, immediately as that excessive rainfall occurs.

The difference, it will be seen, is merely a comparative one, and, in point of fact, the distinction is one without much real difference. In both cases the characteristic features of climate attending the respective seasons and present in the respective areas of cholera prevalence are heat and humidity of the atmosphere, combined with an active evaporation from a more or less moist soil and an excessive range of day and night temperature, with consequent alternations of hot and cold vapours. In other words, the ultimate product of those meteorological changes is, in both cases, chill.

In the southern deltaic areas, with their soil and atmosphere alike saturated with moisture, and which all lie well within the tropics, these conditions of soil and climate are present and operating at periods of the year when they are absent or inoperative in the northern alluvial plains, which lie beyond the tropics, as well as in the plateaux of Southern India, which are for the most part more or less dry, both as to soil and atmosphere. And *vice versâ*, when these conditions of soil and climate are present and operating—for the production of evaporation and chill—in the northern plains and southern plateaux of India, they are more or less absent or inoperative in the southern tropical deltaic areas above referred to. The explanation of these seemingly paradoxical facts is intimately connected with, and indeed solely attributable to, the agency of the most prominent and characteristic phenomenon of the meteorology of India, namely, the phenomenon of its periodical monsoons—a phenomenon of weather which is as peculiar to India as is the constantly recurring periodic prevalence of its cholera. This phenomenon owes its existence to, and is directly produced by, the peculiar geographical position of India—between the range of mountains with a temperate climate circling the boundaries of its northern continent, and the expanse of ocean with a tropical climate washing the shores of its southern peninsula—and to the action of the sun on that country itself on the one side, and upon its surrounding seas on the other. The seasonal action of the sun upon these opposite elements of the regional geography of India, namely, upon its continent and surrounding mountains, but most especially upon its great inland area of arid desert occupying the regions of Central India, Rajputana, Sind, and Southern Punjab, as regards land, and upon its boundary seas, as regards water, results in the periodical recurrence of the summer and winter monsoons, the latter of which is mainly confined to the southern peninsula along its eastern course and the opposite Bay shore of Burma, and may be considered as a continuation of the retreat of the former before the north-west monsoon of the cold weather, which sets in from the northern continent as a result of the southern declination of the sun. The summer monsoon, or hot-weather

rainy season, commences on the western coast of the peninsula usually about the third or fourth week in May, and lasts until the third or fourth week in October, and is known as the south-west monsoon. Its great rain-current, commencing in May, breaks first upon the western coast of the peninsula early in June, and sweeps in a curve across the continent towards the north-west, and pours down its waters as it advances, but with very unequal distribution over the land. In its course from the ocean towards the region of dry and rarefied air, or of low atmospheric pressure, in Northern India, this monsoon-current is guided by well-known physical laws connected with the rotatory movement of the earth, and is given a circular direction round the periphery of the region towards which its current is set; so that, instead of bursting direct upon the arid, thirsty, sandy deserts of Rajputana, Sind, and Southern Punjab, it pursues a circular course round the area covered by them. The force of the current is also in a remarkable degree controlled by the physical elements of the geography of the country over which its course lies. By the western ghâts of Bombay its current is temporarily obstructed and its waters precipitated in heavy rainfall, so that the plateaux to the eastward receive a much smaller and more uncertain supply than the tract at the foot of the ghâts to the westward. Similarly, in its course across the continent, the current is restrained from an early turn northwards by the Vindhya and Satpura mountain-ranges, which separate Northern from Southern India, and is thus kept in an eastward course as far as the plains of Bengal. Here the current is checked by the Himalaya of Assam and Bhutan, and also is joined by that portion of the monsoon simultaneously blowing up the Bay of Bengal towards the same region of heated and dry air in the Punjab. The united rain-currents then sweep onwards towards the north-west, pouring down their waters upon the tracts lying along the course of the mountains, and upon the outer mountains themselves, until the natural limit of the monsoon is reached in the far-distant hill-country lying between the Indus and its Kabul tributaries, with occasionally an extension southwards along the Sulemán Range into the tract of the Derajat, or even down to the confines of Sind. This monsoon-current, which usually commences in the later part of May upon the western coast of the peninsula, does not usually reach the Punjab until the middle of June, and is not generally established in either region until a fortnight or more after its first commencement. It lasts in the Punjab till about the 10th of October, and in Bombay till the 20th of that month, with greater or less forwardness and backwardness, as the case may be, in different successive years. The north-east monsoon, which affects only the eastern coast and southern end of the peninsula, is held to be the reflection of the south-west monsoon blowing up the Bay of Bengal, and lasts till about the middle of December. It is apparently forced back by the cold-weather or north-west monsoon of Northern India, and does not extend inland beyond the line of the eastern ghâts. Its effect upon the Madras deltaic areas in respect to cholera prevalence is similar to that exercised by the south-west monsoon upon those of Bengal, as has been above described.

In this course of the monsoon-currents the tracts of country which receive the heaviest rainfall are—the western coast and ghâts of the peninsula on the Bombay side, the eastern ghâts and northern part of the eastern coast of the peninsula on the Madras side, the Bay shores of Bengal and Burma, and the hill-tracts of Assam; next, the whole system of the mountain-ranges in the line of the course of the monsoon-currents, namely, the Vindhyas and Satpuras, together with the western and eastern ghâts in the line of the south-west current, and the whole range of the outer

Himalayas in the line of the conjoined south-east and south-west currents; and lastly, the plains and plateaux lying at the bases of these mountain systems—at the bases merging into the continent of India. The greater portion of the continent itself receives but a comparatively trivial, and not infrequently a very partially distributed, share of the rainfall brought by these hot-weather rain-currents; whilst some very extensive regions, as the deserts of Rajputana, Sind, and the South-Western Punjab, are left normally altogether outside the influence of the monsoons, so far, at least, as direct rainfall is concerned.

Speaking in general terms, the above description fairly illustrates the course and distribution of the great hot-weather rain-currents or monsoons of India, and which the statistics produced in the preceding pages show to be concurrent or coincident with the prevalence of cholera in point of periodicity, and usually also in point of locality. But although the general course and distribution of the hot-weather rains is as above described, the effects upon soil and climate resulting from such course and distribution of the rainfall are by no means so clearly definable. This is owing to the great variations and the apparent contradictions produced by the agency of local conditions and circumstances affecting the influence of weather upon the soil, the air, and the people of not only different areas, but also of different places in such areas. Yet these effects of the monsoon season are real and as constant in occurrence as are the monsoons themselves, the variations of the effects in one year from those in another corresponding with the variations in character of one monsoon from another.

One of the most striking apparent contradictions or discrepancies, in point of relation between the hot-weather rainfall and cholera prevalence, is afforded by the instance, mentioned in a previous passage, of the marked abeyance of cholera activity during the hot-weather rainy season, provided the rains be in plentiful supply, in the Bengal and other southern deltaic areas, and the greatly increased prevalence of cholera activity during the same season in the plains of the Punjab and North-Western Provinces, and on the elevated plateaux of other parts of the continent of India within the influence of the monsoon-current; and this whether the disease be abroad in epidemic or sporadic form. It was then shown that there was no real difference in the nature of the relation in question, inasmuch as in both instances the main feature of the resultant weather characteristics was a greatly increased activity of evaporation, with its day and night alternations of temperature and consequent chills, and with its attendant changes in the electric state of the air and of its ozone. But it was not then explained why the hot-weather rains in some parts of India were coincident with an abeyance of cholera activity, whilst in other parts of the country they were more or less generally accompanied by a greatly increased prevalence of cholera activity.

The explanation of this apparent anomaly I now proceed to discuss. In the case of Bengal, and other similarly circumstanced deltaic areas, we find that cholera prevalence is most unusually active during the two months preceding and during the two months following the hot-weather rainy season; that is, during the months when the atmosphere is driest of all the months of the year, and the evaporation from an always more or less damp soil is most active of all the months of the year. And we find also that, during the hot-weather rainy season, if the rains are in full or excess quantity, the prevalence of cholera activity in these deltaic areas is either entirely checked or reduced to a lower rate of activity; that is, during the months when both soil and air are supersaturated with moisture, and evaporation is at a complete standstill

or reduced to the minimum in comparison with the other months of the year.

During this rainy season the deltas of the great rivers of Bengal, Burma, Madras, and Bombay (and those of Madras and Burma again in the cold-weather rainy season or north-east monsoon) are more or less extensively inundated by overflowings of the enormously swollen waters of their streams, which at this season are suddenly charged with the entire volume of the drainage of the interior parts of the continent and its bounding mountains included within their several river systems; whilst, at the same time, with the exception only of the area of the delta of the Indus, and, perhaps, to some extent that of the Narbada also, the atmosphere is also supersaturated by moisture from the rain-currents and vapour-clouds of the monsoons. The result of this supersaturation of both soil and air with moisture is an equilibrium of the forces producing evaporation, and a consequent abeyance of evaporation during the period this equilibrium endures, provided the rainfall is not in defect of the normal supply.

In the case of the Punjab, and other similarly circumstanced plains and plateaux in point of comparative dryness of soil and air, we find that cholera prevalence is most active during the actual persistence of the hot-weather rainy season; that is, during the four or five months in which both soil and air are subjected to greater variations of moisture and temperature than during all the other months of the year, and in which evaporation is greatly more active and the daily range of temperature far greater and more sudden than during the other months of the year. And we find also that, during the other seasons of the year, in these dry regions cholera prevalence is either in absolute abeyance or else is manifested in a minimum degree; that is, when both soil and air are equally dry, and evaporation is at a standstill or reduced to a minimum degree, and the night and day range of temperature confined within comparatively narrow limits.

So far as concerns the agencies producing evaporation and consequent chills, with the accompanying changes in electricity and ozone, the condition of the Punjab plains and the other similarly circumstanced plateaux in respect to dryness of soil and air, during the season of the hot-weather monsoon rains, may be held to resemble that of the Bengal and other similarly circumstanced deltaic areas of Southern India during the periods preceding and following their hot-weather rainy seasons. That is to say, the comparative aridity, as to soil and air, of these naturally excessively damp areas at the periods preceding and following the hot-weather rainy season assimilates them, in respect to their conditions at such periods for rapid and active evaporation, and consequent extreme ranges of the daily temperature, with sudden alternations of hot and cold air more or less charged with moisture, to the conditions produced during the hot-weather rainy season in the otherwise naturally comparatively excessively dry, as to soil and air, areas of the Punjab and the other similarly circumstanced, in these respects, plateaux of India; in which the effect of the hot-weather rainy season is to superficially and temporarily saturate the dry soil with moisture, whilst that of its naturally dry atmosphere is to evaporate the moisture thus introduced, with the consequent changes attending the process as above described, the ultimate result being chill or sudden and great alternation of day and night temperatures. As in the Bengal and other deltaic areas referred to the effect of the presence of the monsoon rains is to produce an equilibrium of the forces causing evaporation, or, in other words, an equable temperature in these areas, so in the Punjab and the other similar plains before referred to the

effect of the absence of the monsoon rains is to produce an equilibrium in the forces causing evaporation, that is, an equable temperature in those areas, as was exemplified in the year 1877.

Such, in the main, are the climatic characteristics explanatory of the opposite results produced by the effects of weather upon different areas possessing diverse and opposite conditions of soil and air. Reducing them to a common standard of comparison, the results are really the same, and differ only in the nature of the causes producing them.

So far we have considered in general terms the relation between weather (as represented by rainfall) and cholera as it is illustrated by the statistics of each for regions or provincial areas. With slight modifications, if indeed any real difference at all, the same sort of relation is observed to exist between weather phenomena and cholera activity in the different localities or circumscribed areas of the manifestations of the disease in such regions. That is to say, in whatever place in such larger regions or areas cholera breaks out, its manifestations of activity are accompanied by the same sort of plainly observable weather phenomena as have already been described as being coincident with the prevalence of the disease in the larger areas affected by it, namely, abnormal activity of evaporation, as the result of unseasonable changes of weather, such as excess rainfall following upon a period of drought, producing a local excess of humidity in the air and soil with concurrently an excess over the normal temperature, and an unusual stagnation of the local atmosphere. These characteristic elements of weather are more or less invariable accompaniments of cholera activity, but they are not on all occasions or in all localities of cholera manifestation equally pronounced.

On the contrary, the diversity in this respect is very great, and sometimes presents features apparently the reverse of those above delineated; as, for instance, when cholera breaks out in localities notorious for their general and habitual aridity of soil and air. But in reality the difference is only one of comparative divergence from the established phenomena above described; for even in such localities the habitual condition of aridity of soil and air in the seasons of cholera prevalence is altered to a condition of comparative humidity either by direct local rainfall or by the effects of rainfall in the vicinity upon both the soil and the air of such localities. As a general rule, cholera is observed to occur very much more frequently in relatively low-lying damp situations than in those which are elevated and dry. But the result of experience is, that the disease may occur in any sort of locality under the prevalence of certain conditions of weather or atmospheric influences.

The precise nature of these conditions of weather, and also the mode of their operation upon the human subject in the production of the disease we call cholera, are points which have yet to be determined. But the general nature of the conditions of weather found to be present concurrently with the activity of cholera, and which are perceptible to the senses unaided by artificial or scientific means, are those I have already described. That there are other elements of weather connected or acting in combination with them, but which are not perceptible to the unaided senses, is more than probable. Of these, however, we have as yet no definite knowledge, beyond what is comprised in our acquaintance with the general physical laws which control the various elements of meteorology. But whatever may be the part played by conditions of the weather in determining the development of cholera activity, there is no doubt that those conditions are not the only factors in

operation for the production of cholera; although there is good reason to believe that they are the prime or most important of such factors. All experience proves that there are other conditions also, besides those of weather, which play a very prominent part in the causation of cholera, and the most important of those is the actual health-condition of the individual affected by the disease. This is a subject, however, the discussion of which I must reserve for a later part of this inquiry. At present I am dealing only with the question of the relation between weather influences and cholera prevalence, independently of the other agencies concerned in the development of the manifestations of the activity of the disease.

So far as our experience in India goes, we are taught that the seasons most favourable to the general or epidemic prevalence of cholera are both the hot-weather and the cold-weather monsoon rains in Southern India, but only the hot-weather monsoon rains in Northern India. We are also taught that the disease may, and in some areas of considerable extent does, prevail in local or sporadic prevalence at all times and seasons. And it is this marked difference in the prevalence of cholera during particular seasons distinguished by peculiar characteristics of climate, and in particular localities distinguished by peculiar conditions of soil, which suggests a special inquiry into the nature of those peculiar characteristics of climate and soil and their relation to or direct bearing upon the activity of cholera. It is with this object in view that I have shown the statistics of cholera mortality (so far as they are available for the series of the tweaty years of the history of cholera in India to which this investigation is confined) separately for each district of the several provinces of India under British administration, they being the only areas in the country under regular and systematic registration; and I should have attached to each a brief description of the physical aspects of the area to which the statistics refer were it not that to do so would very greatly increase the bulk of this volume. To enter upon an analysis and comparison of the district monthly mortality statements in detail would enormously increase the length of this work, and has therefore not been attempted. The statements afford a study by themselves, and serve as useful guides not only to a knowledge of the areas and tracts habitually free from or but little affected by cholera, but also to a forecast or prognostication of the future incidence of cholera in the districts habitually or periodically affected by the disease.

In this consideration of the relation between weather phenomena and cholera prevalence I have dealt with the general results furnished by the statistics treated collectively, and the deductions derived from these are, with very slight and unimportant differences, equally applicable to the statistics of the different provinces taken separately. The meteorological phenomena of the monsoon seasons are so prominently marked and so clearly defined that they afford the means of an intelligible explanation in respect to cause and effect in point of their relation to the prevalence of epidemic cholera. And by parity of reasoning, corresponding meteorological phenomena of the non-monsoon seasons, but which are obscurely marked and generally more or less ill-defined, also in their measure afford the means of an intelligible explanation in respect to cause and effect in point of their relation to the occurrence of sporadic cholera.

To understand the argument above advanced we must first examine and determine the changes in meteorology which take place during the monsoon seasons and their relation to cholera as cause and effect. The commonly cognisable changes brought about in the meteorology of a region or country

by the advent of the monsoon rains are an alteration in the temperature and humidity of the atmosphere of the region within the influence of the monsoon. This alteration is perceptible generally all over the region so influenced, but its amount varies greatly, not only in accordance with the unequal intensity and diffusion of the meteorological elements constituting the monsoon itself in the different climatic regions, but in accordance also with the unequal distribution of the physical elements constituting the geography of the different regions or areas of country affected by the monsoon.

In a previous passage I have mentioned Bengal and other deltaic areas as instances in which the physical conditions of the soil and climate operated to counteract the effects produced by the advent of the monsoon (in point of unusual activity of evaporation and consequent chills), as observed in the other areas differently constituted in respect to those physical conditions. At the same time, I explained the reason of these opposite results in the effects of the monsoon rains in the areas so differently conditioned. The great and most characteristic feature in the weather accompaniments of cholera activity, I showed from the evidence of the statistics produced, is an unusual activity in evaporation from the soil, with its consequent day and night alternations of temperature and humidity producing chills. During the monsoon seasons, when these elements of unusual activity of evaporation are most generally and widely diffused over great areas successively with the advance and normal progress of the annual seasons in these areas respectively, we find cholera activity proportionately general and widely diffused, but at the same time controlled very greatly in point of intensity by the special physical conditions of locality, in relation to the nature of the rainfall, and the life-circumstances of particular communities, as well as by peculiarities of the season itself—peculiarities which are marked by a regular triennial cycle of recurring meteorological phenomena. These cyclic periods, as shown by the statistics, do not, as it has been before pointed out, comprise identical years in all parts of India. On the contrary, the cyclic years vary in the different geographical regions, but only to the extent of merging the one cyclic period into its successor, either by the earlier commencement of the periodical cholera epidemic or by its later cyclic prolongation; so that the triennial cyclic periods of contiguous geographical and climatic regions comprised one or more years common to both. What may be the exact nature of the causes which produce these peculiarities of season in the several years of the triennial cycle is a point yet to be determined. But of their reality we have very ample evidence in the periodical occurrences of local variations in the results of agricultural operations; as, for instance, in the local seasonal backwardness or forwardness, or failure of crops, no less than in the periodical occurrence of famines in great areas—in great areas not so affected altogether in the same years, but in succeeding years or cycles of years respectively.

So far as concerns the relation of weather phenomena to cholera activity, our inquiries, in the absence of a wider range of recorded observations, must be limited to the consideration of the facts which are at our disposal. These facts, as already stated, are simply, that seasonal changes of weather producing unusual excess of temperature and humidity of air and soil, with consequent unusual activity of evaporation from the soil, with the resulting day and night alternations of temperature and chill (effects which, in the periodically inundated deltaic areas of Bengal and Madras, can only occur on a large or comprehensive scale after the flood-waters have subsided from the surface of the earth), are the invariable concomitants of cholera activity. I say seasonal changes of weather producing the above-mentioned results, because the

changes referred to are seasonal in their respective climatic regions, and do not occur in the same manner out of their proper seasons. Nor are they accompanied by manifestations of cholera activity out of their proper seasons. The statistics of cholera prevalence (as gauged by the mortality registered) produced in the preceding pages show that the disease, in its seasonal rise and fall of activity, is governed by fixed laws which are intimately connected with, or dependent on, those which control the seasonal meteorology.

That is to say, the mere evaporation of moisture from a damp soil, as in marsh land or canal-irrigated cultivation, is not of itself sufficient to produce manifestations of epidemic cholera; although localities and areas so conditioned, especially such as have a waterlogged soil, are favourite haunts of cholera when the disease is abroad in epidemic form, and are notorious as the hotbeds of malarious fevers and other maladies allied to cholera, and not infrequently are the seats of sporadic cholera itself. For the manifestation of epidemic cholera activity something more is necessary than the mere evaporation of moisture from the earth caused by local conditions of soil and climate. And this something appears to be dependent partly upon the meteorological properties of the different seasons of the year as influenced by the sun, especially in respect to the excess temperature and magnetic or electric elements of those seasons and their effects upon the ozone in the air, and partly upon the actual health-condition of the people, or rather, the individual affected by the disease. Put in other words, weather conditions may be held to be the exciting, and health-conditions the predisposing, causes of cholera activity, and this both in the epidemic and in the sporadic form of the disease. The records of the preceding pages abound in instances illustrative of this assertion, and indeed the fact is so clearly proved by all experience as to require no further comment in this place. Regarding the relation between weather conditions and cholera prevalence, our statistics have shown very clearly that the seasons least favourable to the manifestation of cholera activity are everywhere in India the periods of the spring and autumn equinoxes—when the sun is highest over the equator. They have shown also, with equal distinctness, that the seasons most favourable to cholera activity are the periods of the summer and winter solstices—when the sun is at his lowest declination, north and south of that line, respectively. In Southern India, within the tropics, the summer and winter prevalence of cholera is more clearly marked than in Northern India, beyond the tropics, and the difference is apparently due to the more intense and sustained action of the sun in the former than in the latter region. To the alternate northern and southern declination of the sun are due the periodical recurrence of the two great characteristic features of the annual meteorology of India, namely, the summer and winter monsoons. These seasonal phenomena of weather are most distinctly and forcibly marked in the intra-tropical region, and the least so in the extra-tropical region.

In accordance with this seasonal and geographical disposition of the weather elements, we find the prevalence of cholera activity to be also most distinctly and forcibly marked in the intra-tropical region, and to be least so in the extra-tropical region, as will be seen at a glance by reference to the mortality statements for the several provinces. The statements further show that cholera is far more intensely and widely prevalent during the summer and winter monsoons within the tropic than it is outside the tropic. So far the phenomena of weather and cholera prevalence are in accord both in points of season and severity. In these respects the relation between them is established—as one of regular coincidence at the least.

But as regards the relation between any one or more of the elements of the weather at such seasons, and the activity of cholera coincident with them, our knowledge is defective. At present all that can be positively asserted in this connection is, that during the period of the monsoon seasons there is an excess of activity in the process of terrestrial evaporation over the greater portion of the continent of India, with its accompanying alternations of day and night temperature and humidity, and also an unusual disturbance in the electric condition of the air, as compared with the other seasons of the year. What is the precise nature of this disturbance in the electric condition of the air during the monsoon seasons I am unable to state definitely. But this much appears certain, namely, that at such seasons, owing to the air being then surcharged with watery vapour, which is a rapid conductor of electricity, there is going on a very extensive transfer of electricity from the air to the earth. And it also appears certain that this transfer or leakage of electricity from the air to the earth occurs very unequally as to time and place, according to the weather conditions and soil peculiarities, as conducting media in different localities and areas, or even in different regions of country. To this disturbance in the electric condition of the air is also to be attributed the condition of its ozone. More than this, the information available does not enable me to state.

But it may be very pertinently observed, or objected, that thus far I have traced the relation between weather conditions and cholera prevalence only in respect to the phenomena attendant on the monsoon seasons and the manifestations of epidemic cholera activity coincident and concurrent with them; whereas cholera manifests its activity in a sporadic, and not infrequently also in an epidemic, form at all times and seasons independently of the monsoons. And that, if the disease be dependent—as I assert that it is dependent—for the manifestation of its activity upon its fixed relations to weather, then the existence of the meteorological phenomena characteristic of the monsoon seasons must be shown to be present on such occasions of the manifestation of cholera activity also, before the relation claimed to subsist between weather conditions and cholera activity can be accepted as fairly established. To this task, therefore, I now direct myself, namely, to show that the meteorological phenomena characteristic of the monsoon seasons, when cholera usually prevails in epidemic form, are also present, albeit in a more or less greatly modified form in respect to intensity and general diffusion, during the other or non-monsoon seasons of the year, when cholera usually occurs only in sporadic form. To this end it is necessary in the first place to recapitulate the physical causes which produce the phenomena of the monsoons. Stated briefly, they may be summed up as the results of the action of the sun upon the continent of India on the one hand, and upon the ocean washing the shores of its peninsula on the other. These results are not, as is shown by experience, uniform in successive years, but have a tendency to uniformity in cyclic periods. In the Punjab, as illustrated by the recorded statistics of the hot-weather monsoon rainfall, these cyclic periods are of three years' duration; the first year of the triennial cycle being the year of maximum, the second the medium, and the third of minimum rainfall in each and every cycle. For the other provinces of India a similar gradation is not so clearly or regularly traceable, though there is traceable a tendency to a like periodicity in the character of the monsoon seasons in all parts of India, modified only, in point of time, by geographical position.

However, be this as it may, the causes which produce the monsoons are, as results of the action of the sun, a more or less—according to geographical

position and physical aspect of the country—rarefied and dry atmosphere upon the continent of India, and most especially so in Central and Northern India, and a dense and vapour-laden atmosphere upon the ocean adjoining it, and the consequent operation of physical forces to restore the equilibrium. By the operation of these physical forces are produced the atmospheric phenomena which constitute the monsoon seasons—the summer monsoon, which corresponds with the commencement of these operations and extends into Northern India, where the sandy deserts of Rajputana and Sind are the seats of most rarefied atmosphere during the sun's northern declination; and the winter monsoon, which corresponds with the close of these operations, and is confined mainly to Burma and the east coast of Southern India, where the Deccan plateaux are the seats of the lightest pressure during the sun's southern course—the one being the advancing current with the sun in his northern declination, and the other being the retiring current with the sun in his southern declination.

The most striking elements of the phenomena constituting the monsoon season may be considered as primary and secondary. The primary are the rush of cold vapour-laden air into a region covered by an atmosphere possessing the exactly opposite properties, and the consequent physical changes resulting therefrom, such as general reduction of temperature, general condensation of vapour and rainfall, and general increased humidity of the atmosphere. The secondary are results of the changes produced by the primary, such as evaporation from a wetted soil, alternations of night and day temperature, and humidity, all more or less greatly in excess of the usual course, together with other less clearly perceptible changes in the conditions of the electricity and ozone of the air. These phenomena are not uniformly diffused over the whole region covered by the monsoon, which itself always follows a fixed and definite course, the direction and limits of which are determined by the physical configuration of the country to which it owes its origin and to which its operations are confined. On the contrary, they are distributed very unevenly over the general area covered by the course of the monsoon, in some localities the phenomena being manifested in intensity with heavy rainfall, in others being altogether absent, and in others again being represented only by changes in the atmospheric temperature and humidity without rainfall.

In the like manner, the manifestations of cholera activity in epidemic seasons are not uniformly diffused over the whole region covered by the epidemic. On the contrary, the disease in some localities prevails in great intensity, in others is entirely absent, and in others again is represented by only a few scattered cases. And, speaking in general terms, these distributions of monsoon phenomena and cholera prevalence are mutually coincident. That is to say, in the localities in which cholera is most prevalent, there also are changes in the meteorological conditions most marked, and especially in respect to drought preceding rainfall; in areas from which cholera is absent, there also is a general absence of marked weather disturbance; and in places where the disease occurs only in scattered cases or in mild prevalence, there also are the weather changes but slight and partially distributed. Such is the generally observed course. There are, however, local exceptions occasionally observed in respect to the intensity of particular outbursts of cholera during the monsoon season, in places in which the changes of weather have not been observed to be proportionately great. But in such instances the exceptional severity of the cholera activity is generally found to be due to other favouring conditions con-

nected with the sanitary aspects of the place and with the health standard of its residents, and the previously prevailing weather, especially in point of dryness. Such, in the main, are the weather changes which characterise the monsoon seasons, and are coincident with the periodical prevalence of cholera during those seasons. They are the results of solar heat acting upon a grand scale upon contiguous expanses of continent and ocean, with the results already described. Let us now see how the same results are produced on a miniature scale in the non-monsoon seasons (when cholera manifests its activity only in a sporadic form) by the action of solar heat upon contiguous surfaces of land and water in different parts of the country. We have seen that for the production of the phenomena of the monsoons the essential requisites are the action of solar heat upon the continent of India on the one hand, and upon its ocean expanse on the other; and that the results are a display of physical forces, in magnitude proportionate to the extent of the areas acted upon during particular seasons of the sun's greatest power upon them; and that these forces are brought into action in the operation of restoring the balance of atmospheric equilibrium which was thrown out by the different effects of solar heat acting upon surfaces of land and water. We have also seen that the most prominent of the commonly cognisable effects of the action of the physical forces thus brought into operation are a more or less great alteration in temperature and humidity, with day and night fluctuations of heat and chill, and certain ill-defined, but nevertheless very real, changes in the electric condition of the air and the amount of its ozone.

Now in the non-monsoon seasons we have precisely the same phenomena as those which are above described as characteristic of the monsoons brought into operation at different times and places, but on a miniature scale, by the very same agency, namely, solar heat, acting—at a season of its diminished power upon them—upon contiguous surfaces of land and water; and with precisely corresponding results, and their consequent effects, though naturally in a very greatly moderated or diminished degree of intensity. That is to say, in non-monsoon seasons we have at different times and places miniature and transitory monsoons, or the development of meteorological phenomena in character of their elements corresponding to those of the monsoons, and produced by the very same agencies, acting on a vastly diminished scale, as, acting on a vastly grand scale, produce the regular seasonal monsoons. And coincident with the seasons of these weather changes we have correspondingly small and transitory manifestations of cholera activity, in sporadic form usually, in epidemic form occasionally. These miniature and transitory productions of monsoon phenomena are not always regular or uniform in their occurrence, being dependent entirely upon the conditions of the locality and the momentary state of its weather. Nevertheless their existence from time to time in different localities is a fact, and although the phenomena themselves are not generally observed as they are developed, their results are very commonly so in the familiar "chill."

What is meant to be conveyed by the above argument is best explained by the following illustration. In most parts of the country we have instances of contiguous areas of hard arid land, and land either waterlogged, marshy, or superficially saturated with water, as by floods, field-irrigation, &c. The action of the sun on these differently conditioned surfaces produces rarefaction and rising of the air over the one area, and evaporation of watery vapour over the other, just as it does upon the continent of India and the expanse of its ocean in the production of the regular seasonal mon-

soons; and, comparing the small with the great, the dry surface here corresponds to the Indian continent, and the wet surface to its ocean expanse. The resulting phenomena are the same in both cases, only varied in degree of intensity, namely, a rush of cold vapour-laden air round the periphery and into the dry and rarefied atmosphere adjoining, with the concomitant changes in temperature, humidity, and electric condition, accompanied by always copious rainfall in the one case, and by merely showers or dewfall in the other, and resulting in the production of chills. These weather phenomena of the non-monsoon seasons may recur daily for longer or shorter periods according to time of year and state of weather in point of cloudiness or serenity, and are very variously affected by local conditions of country and climate. And they are observed as affecting not only areas and districts of a region or province, but also as affecting separate localities, and even distinct spots in such localities of the larger areas; as, for instance, in the surroundings of a town or village, where a tract of hard dry waste land, with a marsh, or river-bed, or irrigated fields in the vicinity, afford the requisite conditions under the action of solar heat for the production of the climatic phenomena and other results above described; or, as in the instance of a private dwelling-place, where hard dry roads and masonry-walls, with irrigated gardens or fields or sheets of water adjoining, furnish the ready agents under solar action for the production of the climatic changes and chills above alluded to. The difference between the climatic phenomena of the monsoon and non-monsoon seasons is thus reduced to one of comparative degree only, the intensity, violence, and wide diffusion of the regular monsoon phenomena being proportionate to the magnitude of the areas affected, and to the seasonal power of the sun's action, whilst the opposite characters of the non-monsoon phenomena are commensurate with the limited extent of the surfaces acted upon and with the diminished power of the sun's action in those seasons, in both cases the ultimate results being the same.

These phenomena of climate—of local climate—are infinitely varied and modified by surrounding circumstances, but the main result is the production of "chill," whether perceived or not, whether accompanied by noxious exhalations from decomposing organic matters or not. The effects of chill depend very much upon the character of the chill in respect to its relation to temperature, and to combination with gaseous and vapoury products of the decomposition of organic matters, and also upon the health-state of the individual exposed to its influence. This, however, is a subject I must leave for discussion in a later passage. At present we are concerned only to show that, as in the regular monsoon season the most prominent of the commonly cognisable meteorological concomitants of cholera prevalence are sudden changes in temperature and humidity, and also in electricity and ozone, so in the non-monsoon seasons the most prominent weather concomitants of cholera activity are corresponding sudden changes in the local climatic conditions.

So far I have only shown how these corresponding meteorological phenomena of the monsoon and non-monsoon seasons are produced and occur, but in the case of the non-monsoon phenomena I have not shown them to be specially concomitant with the manifestations of cholera in a sporadic form. And this it is not possible to do without a lengthy detail of the histories of a series of individual cases in which the attack of cholera is known to have been directly connected with exposure to "chill," or to weather calculated to produce chill. Indeed the production of such evidence in this place is not necessary, since the point is sufficiently illustrated in the historical records of

the preceding pages—records which furnish abundant and clear proof that chill does play a very important part in the direct causation of an attack of cholera in those who are otherwise predisposed to an accession of the malady. But it may be objected that the mere exposure to chill cannot be the true cause of cholera, because, apart from the regular monsoon season, chills, as above described, are occurring at all times and places, whereas cholera is met with only occasionally and in widely separated localities during the non-monsoon seasons. In order to answer such objection and show that cholera really is caused by chill it becomes necessary first to define what is meant by the term cholera.

Indeed a correct understanding upon this point is of the first importance, not only for the explanation of the causes which produce the disease, but also for the right apprehension of the proper measures required for its rational practical treatment. Hitherto, and more especially so in recent years, a great diversity of opinion has prevailed as to what is and what is not cholera. Much confusion and mystification have been thus created, with the result of an absurd stultification of the principles upon which practical measures for its treatment have been based.

The Special Cholera Commission of 1861, in their report (page 258, paragraph 434), wrote—"There is a common impression that there is something essentially strange and mysterious in all that concerns this disease, and that it is almost hopeless to attempt to lay down any principles of any kind regarding it. There can be no greater mistake. There is perhaps no disease which has more strongly marked and invariable characteristics which regularly present themselves during every epidemic attack, and it is this fact which gives room for hope that means may be found for its prevention. It is only when we come to the purely medical part of the question that we must admit that we know at present almost nothing. This exaggerated notion of the mysterious character of cholera often tends to prevent people from taking the most obvious measures of precaution." And then, after quoting instances and authorities in point of the advantages to be derived by abandonment of the locality affected by cholera, the Commission recommended, as the great practical measure for the prevention of the ravages of cholera, a systematic removal into camp of the bodies of troops among whom the disease made its appearance. This recommendation was adopted by Government, and the experience during the past sixteen or seventeen years of the practical test of the measure has conclusively proved its inefficacy to check the attacks of the disease so long as the epidemic influence producing it was present or abroad in the vicinity. In stating "that it is only when we come to the purely medical part of the question that we must admit that we know at present almost nothing," and in speaking of the disease only by the characteristics of its last and most hopeless stage, the Commission could have made no greater mistakes. The effect of these authoritatively promulgated views has been to divert attention from the correct descriptions of cholera given in standard works on medicine, and to concentrate it upon the appearances which are characteristic of the disease only in its severest and most fatal form; and with the natural results of confusion and stultification in the practical measures adopted for its treatment.

It has been a steadily growing custom of late years among medical men in this country to reject as cholera all cases in which the disease does not present the symptoms of its last and most dangerous stage, characterised by the so-called "rice-water stools" and suppression of urine; forgetful of the fact that the one cannot appear until the bowels have been cleared of their

fœcal contents, nor the other until the drain of fluids from the blood has left none for the secretion of urine. No more mischievous practice could be followed so far as concerns the successful treatment of the disease, nor so far as concerns the practical sanitary precautions adopted in the belief of its being contagious. In the one case the patient is allowed to drift into a stage of the disease in which treatment by medicine is impotent, whilst in the other, apart from the futility of precautionary measures of prevention adopted only at so late a stage of the disease, an amount of injury and vexation is caused which has not infrequently given rise to the expression that "the cholera is less to be dreaded than the doctor."

Under the views at present generally held regarding the distinguishing symptoms of cholera and the contagious nature of the disease, nothing could be more absurdly contradictory and unnecessarily vexatious than the practice pursued in our measures of treatment and preventive precaution—the latter more especially so when, as is usually the case, they are authoritatively carried out by police agency among the civil population. In every outbreak of epidemic cholera much mistrust and discontent are produced among the people by our inconsistent measures of medical treatment and preventive precaution. It is a common circumstance in every epidemic of cholera to find cases of the disease attended by mucous, bilious, or hæmorrhagic diarrhœa rejected as cholera simply because of the absence of the severer symptoms of serous diarrhœa (rice-water stools and suppression of urine); and this notwithstanding the fact that in very many cases the milder forms of the disease, rejected as such, are actually observed to pass into the later and graver stage, the only one recognised as distinctive of cholera; yet, as a matter of fact, they are all cases of genuine cholera. And if, as is asserted by some, the disease really be contagious, are all alike capable of spreading its contagion. More than this, in every epidemic outbreak of cholera there are a very much greater number of cases which never pass beyond the first or mildest stage of the disease, namely, that of malaise, which is either dyspeptic, catarrhal, or febrile in character according as, with the epidemic nature of the season, the subsequent type of the disease determines to cholera, influenza, or malarious fever. It is a common experience in this country to find all three forms of disease, namely, cholera, influenza, and malarious fever, running an epidemic course together, sometimes merging the one into the other, but usually coalescing in malarious fevers of the intermittent or, occasionally, of the remittent type, as the prominent feature of the epidemic, which itself is usually designated by the name of the disease most prominently prevalent at its different stages, as either cholera, or malarious fever, or pleuro-pneumonia. In the Punjab, the season of epidemic cholera is during the summer months, that of malarious fever during the autumn months, and that of epidemic catarrh during the winter and spring months. This is what is usually observed when these diseases prevail as distinct epidemics in the Punjab; but in the North-Western Provinces and Bengal, as also in Burma and the southern peninsula generally, this seasonal prevalence has not been so clearly defined. Whilst in respect to simple fever and catarrh, or cold, they occur everywhere, at all times and seasons, as results of exposure to vicissitudes of the ordinary weather.

These remarks have been made here with the object of showing the importance of recognising the true nature of cholera, and the necessity of dealing with it in its earliest stages; for although, in epidemic seasons, a certain proportion of the attacks, just as is the case in epidemics of influenza and malarious fever, are extremely sudden and severe in their onset and fatal in their results, the vast majority of them are preceded by premonitory

symptoms of more or less duration and more or less pronounced. And if we are ever to combat the disease successfully, we must take these points into serious consideration. Among the general population there is little hope of much good being effected in this respect until the people are not only better informed than they are at present, but, also, until they are better conditioned in their general circumstances of life—in their general material prosperity—and most especially in respect to the quality of their food, clothing, and shelter. But, among the troops and other classes under the control of Government, it is my firm conviction that much can be done to reduce the mortality annually occurring from cholera in this country. My recommendations on this point will form the subject of a separate section.

I have referred above to the discontent caused among the people by the so-called sanitary precautions or preventive measures authoritatively enforced by the agency of the police during outbreaks of cholera. Although these precautions are generally judicious and necessary, there are some which are open to objection, and especially one which, I think, should be put into practice only in exceptional cases. I refer to the practice of destroying by fire the clothing and bedding used by patients who have died of cholera, and in some instances even the furniture of the rooms occupied by them. The practice causes much discontent, as the compensation awarded is seldom considered equivalent to the value of the property destroyed, and is, besides, in itself utterly useless, owing to its partial application, for in the cases of those who have survived attacks of the disease no such measures of destruction are pursued. I consider the practice reprehensible in itself and quite unnecessary, because it is inconsistent, and, as carried out, it is not calculated to attain the object aimed at. If cholera really be contagious, all that is necessary for the destruction or prevention of its spread by that means is free ventilation and exposure to the sun and air, with perhaps the aid of disinfectants and fumigations where considered necessary.

The affliction produced by cholera is sufficiently grave of itself not to be needlessly increased by profitless measures of remedial treatment. And these are the greater reasons for our arriving at a correct understanding of the nature and causes of the disease, and of the practical measures best calculated to mitigate or prevent its destructive ravages. To these ends our first inquiries must be directed to ascertain and determine the causes which produce cholera, and the symptoms by which the operation of these causes is manifested. We may then be prepared to consider the means best calculated to prevent the occurrence of the disease or to check its progress when established. What, then, is cholera?

My answer is that, in my opinion (based upon a long-extended practical acquaintance with the disease, dating from the epidemic of 1848–49 in England, that of 1855 in Turkey, an outbreak in Bengal in 1856, and since the latter year successive epidemics and seasonal outbreaks in the Punjab, besides a personal experience of four several attacks of the disease in its severest form, and also based upon a tolerably fair acquaintance with the literature of the disease and the official records and statistics of its prevalence and deportment in British India during the past twenty years), cholera is simply an influenza or catarrh of the mucous membrane of the alimentary canal precisely homologous to the influenza or catarrh of the mucous membrane of the respiratory passages. As to the general characteristics of the disease, in respect to origin and diffusion, the following extract from Copland's Dictionary, article "Influenza"—which is quoted by Bryden in the introductory section of his "Cholera in the Bengal Presidency from 1817 to

1872," who says it might almost have been penned with reference to cholera, "as he describes the disease, merely substituting the one term for the other throughout"—so exactly applies to cholera as I understand the disease that I reproduce the passage here, reading cholera for influenza throughout. Copland writes—"That influenza neither originated in nor was diffused by contagion, direct or mediate, seems satisfactorily proved by the nature of the disorder, and by the phenomena and circumstances connected with its appearance and spread. No facts have been adduced of a contagious property, according to the meaning I have attached to the term, having belonged to it, whilst numerous circumstances, showing that it was devoid of such property, have been observed by all who were practically acquainted with it. The almost simultaneous outbreak of the epidemic in distant countries, the rapidity with which it traversed immense spaces, the fact of its often pursuing, in its spread, a different course from that of human intercourse, the great numbers attacked at the same time when it appeared in a district or town, and the frequent suddenness of the seizure, showed that it proceeded chiefly from a very generally diffused change in the atmosphere that modified or infected the system in a determinate manner; that this malady depended principally upon atmospheric influence these and other considerations fully prove, but that in some instances other agents or causes concurred with or aided this the principal cause may be admitted. These other concurring or aiding causes seem to have been the ordinary exciting causes of catarrh, and infection proceeding directly from those labouring under the malady. It was often observed that communication with those already attacked appeared to favour the development of the complaint in the healthy; for when an individual came with the disease from a distance, the inhabitants of the house in which he arrived were usually the first attacked. But it must be conceded that this infection was a very subordinate cause to that upon which the epidemic principally depended, and that it was merely a concurrent and contingent circumstance in the diffusion of the complaint." And further, I believe, from an extended practical and personal experience of the maladies now coming under consideration, that the two above-mentioned different forms of influenza or catarrh are intimately related to a still more different form of the same disease, as represented by the train of symptoms which characterise what are commonly known as malarious fevers, whether of the intermittent, remittent, or continued forms, and that they are all dependent for their production upon peculiar conditions of the weather, aided by those of soil and locality, as the exciting causes, and upon certain conditions of the individual health as the predisposing causes.

An extended and general experience of the deportment of these diseases, supported also by the testimonies as recorded in the successive annual sanitary reports of the several provinces of British India, is corroborative of the fact of an intimate relation and interdependence between these diseases, and of their direct connection with conditions of climate and peculiarity of season, combined with those of the individual health standard, as effect and cause. The three forms of disease are constantly met with prevailing together and merging the one into the other; and this is especially the case in seasons of their epidemic prevalence. Although, from the nature of the case—our statistics dealing only with deaths—I am unable to produce figures in substantiation, I can, from personal knowledge, record my testimony to this effect. Indeed, these facts have long been known to medical men of extended practical experience in this country, but their due importance has been counterbalanced and overlooked by reason of the greater

attraction of theoretical novelties diverting the attention from the proper study and appreciation of the physiological and pathological phenomena presented to our observation by the symptoms which, in all their great variety and degrees of intensity, mark these diseases. It is the fashion nowadays practically to ignore the influences of weather and conditions of life upon the physiological properties of the human body, and to underrate their direct effects upon the mutual relations of its great viscera in the naturally harmonious performance of their several functions for the maintenance of a healthy state. Too often do we fail to give due attention to the various circumstances of life and vicissitudes of weather which are continually occurring—and periodically in a degree of greater intensity and more general prevalence—to tax the natural powers of the body, and the normal functions of the several organs on the proper action of which its health and life depend. Instead of giving the fullest attention to the causes which, whether in the individual body itself or in its surroundings, operate to alter the usual or natural conditions requisite for the normal or healthy discharge of the bodily functions, there has been of late years a growing tendency in this country to fix the attention upon fanciful notions and to pursue phantoms, and with the result, which was to have been expected, of no real progress in either the mitigation of the severity of these diseases or in the prevention of their occurrence. The popular notion of the day is to fix the cause of cholera upon a specific germ, of the mere existence of which, however, no proof has yet been adduced. But, for the sake of the argument, granting the germ and its power to produce an attack of cholera, I maintain that the more reasonable means of combating or destroying its deadly effects is not by direct attacks aimed at the invisible enemy, but by efforts and measures directed upon the fortification of the individual exposed to its assault. If the real cause of cholera be a specific germ, one of the multitudinous varieties of those minute organisms which are at all times and seasons diffused through the air we breathe, then I hold that the healthy body is capable of disposing of it without personal inconvenience or injury along with the other similar forms of microscopic organisms with which it has constantly to deal in the ordinary course of life. Therefore, our main efforts should be devoted to the maintenance of the most perfect state of health attainable in the individual, more especially during the period immediately preceding the anticipated advent of the dread foe, whether it come in the form of epidemic cholera, or epidemic catarrh, or epidemic malaria. All these maladies are, it is well known by experience, very closely associated with seasonal influences; but whether they owe their origin to the direct effects upon the body of these seasonal influences, or to their indirect effects upon it through the agency of organic germs brought into vitality by them, as is vegetable life in general by seasonal influences, is an unsettled question, and at present a mere matter of opinion. So far as my lights direct me, I can see my way to the production of these diseases by the simple disarrangement of the physiological functions of the organic viscera of the body through the action of seasonal and weather influences alone, without the intervention of any germ whatever as an agent. And this I shall endeavour to explain in a later passage.

That the entire prevention of the occurrence of these diseases is possible we have no grounds, in the present state of our knowledge, for entertaining even the hope. But that the suffering and loss of life caused by them may be very materially diminished from the degree of severity which we now experience, and that by means within our power, there is, I believe, no manner of doubt. To attain this end, however, it is a prime essential that we first

arrive at a clear and correct knowledge of the nature and causes of the diseases concerned; and when we have done this we may reasonably hope to combat them with success.

So far as regards the subject now in hand, we are concerned only with the consideration of cholera, and to this disease therefore—which, I may here observe, is the least destructive to health and life of the three above named, although it is by far the most alarming and dreadful, on account of the suddenness and fatality of its outbreaks in epidemic seasons—I confine my attention, with only such brief reference to the others as may be found occasionally necessary in order to illustrate my remarks upon cholera.

What, then, is cholera? The definition of the disease, as generally recognised for the purposes of the history and statistics produced in the preceding pages, has been given in an earlier passage (in the introductory remarks) of this history, and, as there stated, it refers only to the severest forms of the malady, and to the symptoms characterising its last and most dangerous stage. But this definition, however useful it may have proved for the purposes of statistical record, in no way describes the real nature of the disease or the various forms in which it is commonly met with. In fact, the result of the adoption of this definition has been to make a distinction, whether advisable or otherwise I am not called upon to say, between not only the different forms, but also the different stages, of the disease, and to fix the name of cholera, the true nature of which is aptly described by the name itself as "bile flux," upon its most severe form, and upon it only when it has reached the last and most fatal stage, characterised by the appearance of purely serous diarrhœa and suppression of urine; that is to say, by symptoms which present themselves after the bowels have been previously cleared of all fœcal and other colouring matter, and the kidneys have been deprived of their customary supply of fluid wherewith to secrete urine by reason of the excessive drain of the bodily moisture through the bowels and the skin. These symptoms, then, by no means represent the cholera disease in its true or full character, either in epidemic or sporadic manifestation of its incidence, although the name cholera or "bile flux" sufficiently describes the ordinary character of the disease. Nevertheless, without the presence of these two grave symptoms the malady has in the vast majority of instances been rejected as cholera, and been styled either dyspepsia, or bilious diarrhœa, or choleraic diarrhœa, or fever—sometimes intermittent, sometimes remittent, and sometimes choleraic—according to the fancy of the reporter, guided by the symptoms most prominently engaging his attention. And this is the case not only in the hospital practice among the troops and jail populations, but also in the mortality returns relating to the general civil population. The form of the disease attended by bilious diarrhœa and vomiting, although it be accompanied by cramps and sweats and a general depression of the vital powers tending to the production of collapse, is frequently considered and treated as intermittent or malarious fever, even though the cases prove fatal within twenty-four or forty-eight hours. And I have known instances in which the disease, attended with hæmorrhagic diarrhœa instead of the bilious form of that symptom, has been, and this during the prevalence of epidemic cholera, regarded and treated as remittent fever in the hospital practice of a European regiment, as well as in that of civil dispensaries, thus stultifying the measures of segregation and other sanitary and medical precautions rigorously enforced in regard to the severer forms of the disease, which only are recognised as cholera.

Now it is admitted by the highest authorities on the subject of cholera

that the disease, as it is met with in India at least, presents itself in three different forms or stages of development, each of which may, and as a matter of fact often does, prevail, during epidemic seasons especially, independently of the other; that is to say, without necessarily passing through the several stages from the milder to the severer forms. The three forms or stages of cholera above referred to are these, and they are habitually met with in every season of the epidemic prevalence of the disease in India:—

1. That of malaise or general discomfort of body (without any markedly great or serious constitutional disturbance), consequent upon more or less trivial and transitory derangement of the normal balance between the functions of the great eliminating organs of the body—the skin and lungs externally, and the liver and alimentary system internally—and attended by a more or less marked depression of spirits and nervous energy generally, until the temporary derangement is rectified by the vicarious action of the organs unaffected by the influences producing the original derangement; or, in the event of their failure, by fever more or less severe.

2. That of cattarrhal diarrhœa, or, as it is termed, premonitory diarrhœa, either bilious or mucous, indicating the efforts of the liver and digestive canal to readjust the disturbed balance of functions originating in derangement of the action of the lungs and skin, by which an excess of water is thrown upon the blood. These efforts are aided also by the kidneys, and usually without pain or constitutional disturbance. But if these vicarious efforts fail, then the ailment is attended, among other signs of functional disturbance, by a more or less marked febrile activity.

3. That of colliquative diarrhœa, either serous or hæmorrhagic, which is often accompanied by vomiting and sweating, and tends rapidly to collapse, the symptom of suppression of urine appearing as the result of the excessive drain of fluids from the body. In some epidemic forms of the disease either the vomiting or the sweating assumes the colliquative character instead of the diarrhœa, and in the more malignant cases all three may be colliquative together, the result being a profound collapse and speedy death; or, on the other hand, as occasionally occurs, all three of these symptoms may be conspicuously absent, and death result speedily from shock produced by sudden and unremedied arrest in the functional actions of the skin and lungs; the blood being surcharged with water and salts.

These are the three typical forms or stages in which the cholera disease is met with in India, and more especially in seasons of its epidemic prevalence. But between them are numerous gradations of symptoms linking one form with another, and varying in each case with the infinite diversity of surrounding circumstances and individual idiosyncrasy which control and determine the particular course of events. In epidemic manifestations of the disease, among the circumstances controlling or determining the type or form which it assumes, by far the most active and important is the special character of the epidemic season itself; and next to that comes the general health standard of the people as affected by the food-supply and the conditions of life in respect to shelter, clothing, and sanitary surroundings; and to these may be added the personal conduct of the individual towards his own body.

In respect to the special characters distinguishing different epidemic seasons, our knowledge is extremely defective, and the main indications of their distinguishing features are derived solely from their effects upon the diseases they produce, and the particular forms or types these diseases assume during the period of the epidemic season in each case. Nevertheless

there is, I think, reason to believe that the character of the epidemic season is in all cases dependent wholly upon meteorological influences, and that in the production of certain forms of disease these influences operate by acting upon the body either directly through the air or indirectly through their action upon the soil. However, be this as it may, I judge of the character of the epidemic season by its effects, and, as the result of experience, say that, as regards cholera—the disease now more especially engaging our attention—if the epidemic season be of mild nature, then the mild form of the disease, or that of cholera malaise, is vastly more prevalent than either of the severer forms. If the epidemic season be of severe nature, then the second, and to some extent the third form also, predominates more markedly than in the milder epidemic season. But if the epidemic season be exceptionally severe, then the third or gravest form of cholera prevails with greater intensity than in the less severe epidemic seasons, and often with a suddenness and violence of attack which are appalling by the rapidity with which such attacks kill.

These epidemic seasons, as our statistics have abundantly shown, occur at regularly recurring intervals in every year, and with gradations of intensity in every triennial cycle. But on these occasions they do not uniformly overspread the general area of the country. On the contrary, they are strictly limited in the spheres of their influence to particular regions, and to tracts of country in those regions, passing in periodical rotation from one region to another, in a manner analogous to that which is observed in respect to the seasonal influences producing drought and famine. Just as these deviations of seasonal weather vary in kind and degree of divergence from the normal standard, and produce accordingly either deterioration of crops, shortness of crops, or total failure of crops, so do corresponding deviations of seasonal weather produce mild, or severe, or fatal epidemics of sickness. In the case of cholera these epidemic seasons are severest when they follow periods of drought and are coincident with the pressure of famine. Such epidemic seasons are distinguished by special characteristics of weather, among which increased temperature and humidity, with a remarkable stagnation of the air, are those most prominently observed. In such seasons cholera frequently prevails with a severity and malignity which is appalling by the rapidity and concentration of its fatality.

It is this sudden fatality of cholera within circumscribed limits of locality which has so often struck terror into the community upon whom the disease may fall, and which, diverting the attention from other most important considerations, has endowed the disease with a mystery and dread which have gone far towards preventing its proper study and understanding, and consequently its reasonable treatment, both preventive and curative. Yet on calm reflection and examination we find that the suddenness of onset and fatality of some forms of cholera—the severer epidemic forms included—are really no greater than, if indeed so great as, the suddenness of onset and fatality of the severer forms of the allied epidemic diseases known as malarious fever and contagious catarrh or pleuro-pneumonia, or even as the equally dependent upon seasonal influences sunstroke or sun-fever.

In each of these diseases, in epidemic as well as in non-epidemic seasons, there are observable gradations of form or stage corresponding to those described in respect to cholera; and their prevalence severally, according to the character of the epidemic season (often aggravated or mitigated in its effects, as the case may be, by conditions of locality affecting its soil, climate, and population), is in striking agreement with what has been above described

in relation to cholera. For instance, the forms of malady commonly designated by the term *malarious fever* present, especially in seasons of their epidemic prevalence, degrees or stages corresponding in their gradations of severity to those already mentioned in respect to cholera. That is to say, we find in the mildest or simplest, and by far the most common form, merely febrile malaise of a transitory kind, unaccompanied by any marked constitutional disturbance, and, with ordinary care, usually righting itself by the natural efforts of the body.

But, from want of proper care, or prolonged or repeated exposure to its producing causes, this form usually passes into the next severer form, that of intermittent fever, marked by decided febrile accession and accompanied by more or less severe and prolonged constitutional disturbance, as a consequence of the derangement in the normal relations subsisting between the general eliminating functions of the body, and resulting not infrequently in greater or less serious injury to the general health through permanent damage to one or more of the great excretory organs, with sooner or later a fatal termination. This form of malarious fever is met with presenting a remarkable variation of symptoms and diversity of results, but its typical form is that which is known by the familiar term "ague," the technical term *algid fever*. It very often, especially in epidemic seasons and in epidemic localities, presents symptoms undistinguishable from those of the severest forms of cholera.

This form of malarious fever—the intermittent, ague, or algid form—not infrequently merges into the next severer form of malarious fever, viz., that of remittent fever. But commonly the remittent form follows upon the stage of malarious malaise without passing through the intermittent stage, though in seasons of epidemic prevalence of these malarious fevers the different forms are so intermixed and confused by participation in common symptoms that it is sometimes impossible to draw the line between them, or even to distinguish them from cholera. Frequently an epidemic of malarious fever commencing with the intermittent form as its type is found to merge into the remittent form, and more or less so completely that the severer form becomes the type of the epidemic. In such cases the intermittent form—with greater or less rapidity and violent aggravation of symptoms, according to the special character of the epidemic season and controlling circumstances of a local nature, coupled very frequently with individual idiosyncrasy and conditions of life—passes into a yet severer and frequently very fatal form of the remittent disease—still frequently overtaken by symptoms undistinguishable from those of malignant cholera—involving grave constitutional disturbance and inflammatory lesion of some or other great organ of life. This form of malarious fever is met with under a great variety of more or less prominently distinctive symptoms, but its typical form is that known by the name of bilious or yellow remittent fever.

All three forms (as well as sun-fever, to be mentioned presently) originate in derangement of the functional services of the body produced by the injurious effects of weather influences; and they owe their subsequent severity and development of special symptoms to the complications ensuing upon the vicarious efforts made unsuccessfully by other functional organs to restore the normal state of their mutual relations in the body, and to the operation of other unfavourable influences connected with the conditions of locality and life-surroundings. In other words, when the climatic and weather influences are slight and transient the form of disease is mild and transitory; when they are severe and prolonged the disease is more serious, and complicated by intercurrent accidents, and especially by repeated exposure

to the disturbing influence; but when they are intense, and, as is usually the case, follow periods of previous trial, such as poverty and famine, then the disease appears in its gravest forms, and is destructive in proportion to the unfavourable circumstances of those exposed to its operation.

As in the cases of cholera and malarious fever, so in that of common catarrh or influenza, the disease, as usually met with both in ordinary and in epidemic seasons, presents corresponding grades or stages of severity, ranging in infinite varieties of degree from the simple and transitory form known by the term "cold," through the next severer form of the disease known by the name of catarrh or influenza—which in epidemic seasons is often fatal with extreme rapidity, and is always accompanied by a very marked prostration of the nervous powers, in addition to the special local symptoms of the disease—to the severest form of all, that known as epidemic or contagious catarrh—the pleuro-pneumonia so fatal in its effects, especially among the poorer and destitute classes of the population. These forms of catarrh bear a striking analogy to the several forms of cholera I have described. Thus the first form—cold or catarrhal malaise—corresponds to the stage of cholera malaise, and, like it, is usually of a slight and transient nature, attended with but little constitutional disturbance, and commonly righting itself by the natural efforts of the body under ordinary care and attention. The next stage, or that of influenza or acute catarrh, corresponds with the stage of catarrhal or bilious or choleraic diarrhœa, and, like it, is attended by a defluxion—a defluxion of mucus or serum from the air-passages—which may be profuse and yet be followed by resolution, or may be restrained and lead to bronchitic inflammation and other complications. The third stage, or that of epidemic catarrh, corresponds in severity and fatality with the third or epidemic stage of cholera, and, like it, is attended by a sero-purulent defluxion which is more or less profuse and sudden in its discharge, but is usually infiltrated into the vesicular substance of the lungs or coagulated upon their surfaces. Apart from this parallelism in the course of these two different forms of catarrh—influenza catarrh and cholera catarrh—there is no similarity in the successive train of their symptoms. Nor, indeed, is this contrary to expectation, considering the different anatomical and physiological relations of the two sets of mucous membranes affected—those of the respiratory system, with only the lungs as their great excretory organ, and those of the alimentary system, with the numerous great and important glands in direct connection and intimate relation with them.

A similar series of stages, or degrees in the gradations of severity, is observed also in respect to sunstroke or sun-fever or ardent fever. Thus we meet with the malady in its simplest form as a febrile malaise, febricula, or ephemeral fever—mild and transient in its course, and quickly righting itself through the natural efforts of the body without ill effects or much constitutional disturbance.

In its next severer form we meet with the disease as simple continued fever, which, according to the character of the epidemic season and the surrounding influences, may be of a benign nature tending to a natural resolution and restoration of the healthy condition, or it may assume more or less malignant features attended by grave complications, ending in a fatal issue. Finally, we meet with the disease in its severest and most fatal form as sunstroke or heat apoplexy, characterised by the sudden accession of ardent fever, with determination to the brain, and attended by grave constitutional disturbance, with more or less profound shock to the volitional nervous system.

Now in each of these three classes of febrile disease—malarious fever,

catarrhal fever, and sun-fever—the elements of weather admittedly play a conspicuous part as the influencing cause. The operation of the same agency, however, is not so readily conceded as the influencing cause in the case of choleraic fever. Yet, if we consider the character of the symptoms and the courses severally pursued by these four classes of allied febrile disease as commonly met with in India, and compare them one with the other, we cannot fail to be struck by the remarkable prominence of the analogy that runs through the whole series. And to those who have had an extended practical and observant acquaintance with the common diseases of this country, more particularly as they present themselves in epidemic seasons, it must be a well-known fact that the four classes of disease above mentioned are occasionally found to be so intermixed by community of symptoms that it becomes a matter of doubt, if not of inability, to determine where the line should be drawn between them, more especially in their earlier and milder stages, before their characteristic special symptoms become developed. And even in this latter case it is by no means a rare occurrence to meet with cases of simple influenza or catarrhal fever simulating ague or intermittent fever; of ague or algid fever simulating cholera; of insolation or sunstroke simulating sometimes ague and sometimes cholera; and, finally, of cholera itself so closely simulating malarious fever, either intermittent or remittent—in some epidemic seasons the latter more commonly—that it is the usual practice to consider and treat cholera as malarious fever until the development of the last stage of the disease, characterised by the appearance of serous diarrhœa and suppression of urine, determines the diagnosis to cholera.

The main difference between these four diseases in the initial stage of their development lies in the different results immediately following upon derangement in the functions of the skin and lungs caused by influences of weather. In cholera and catarrh or influenza this functional derangement is reflected immediately upon the (continuous with the skin) mucous membranes of the alimentary canal and respiratory passages respectively, and with results appropriately appertaining to them severally. In malarious fever, on the other hand, the great excretory organs in the interior of the body, but in direct functional relation with the skin and lungs, are the parts most seriously affected by the derangement in the functions thereof; and in the case of ague, or the algid form of malarious fever, the resulting disturbance is attended by a shock more or less profound to the sympathetic nervous system marking the cold or collapse stage of the disease. In sunstroke, again, although the first effect of functional derangement of the skin and lungs is reflected upon the great internal excretory organs, it is rapidly communicated from them through the circulation to the brain, and, under certain circumstances, with a shock to the volitional nervous system so severe and sudden as to produce the coma or apoplexy characteristic of the severer forms of the disease. Such are the main features of the difference between these four classes of disease in their initial stage. And indeed the difference is more apparent than real, for at the outset the symptoms in their successive train bear a common general resemblance; and although they diverge more or less rapidly, widely, and distinctively as the malady advances to a determination in one or other kind of disease, according to the epidemic tendency of the season or other controlling influence, they indicate, in the first place, a disturbance in the balance of the functions performed by the great eliminating organs of the body. This disturbance is marked by the train of symptoms denominated very aptly malaise, or "out of sorts," a state which may be transitory or prolonged according to the severity of the producing causes

and the recuperative powers of the individual. In the second place, these common initial symptoms indicate the natural efforts made by the body through the agency of its great secretory organs to readjust the disturbed balance of its organic functions. These efforts, which are sometimes manifested by symptoms of considerable activity and violence, may succeed in restoring the normal equilibrium, and the body then gradually recovers itself. Or, finally, in the third place, the common initial symptoms indicate the failure of the organs to readjust their disturbed balance of functions; the work of elimination is checked, relief by defluxion does not take place, and the process of combustion, in a greater or less degree, is transferred to the capillary absorbents, producing fever; and they then pass into a more advanced stage indicative of the development of various complications, the character of which distinguishes the disease and determines its ultimate issue in resolution or dissolution.

However interesting and important the inquiry is, on its own merits, to endeavour to ascertain and fix the conditions and causes which operate to determine to the preference of the particular functional derangements and organic lesions which constitute the distinctive features of these several diseases in their more advanced stages, in this place we are not concerned to enter into a detailed consideration of the pathology of these several kinds of disease. But it is necessary for the purposes of the elucidation of my argument that we should investigate—and more especially in respect to the disease with the consideration of which we are now more directly concerned, viz., cholera—the manner in which these diseases generally commence, and the manner in which they progress towards recovery or death, with the view of ascertaining and determining the causes which produce this manner of commencement and subsequent progress.

To this end, then, it behoves us, in the first instance, to bear in mind the teachings of physiology—to remember that the living body is a complex organism made up of different parts which are all bound up together and inseparably associated in the unceasing work of maintaining its life, and which are all kept in a fit state for the performance of this duty of maintaining its life in a healthy state by the harmonious co-operation of the great organs whose special functions are to serve the natural requirements of the living body to which they belong. These great organs of the body are comprised under five distinct systems, each of which is endowed with its own special functions in the general living economy. These systems, speaking in general terms, may be very briefly described as—

1. The nervous system, which presides over, directs, and controls the interdependent relations of all parts of the entire body, and brings them into sentient communication the one with the other and with their own proper nervous centres, which are two, both brought together in the brain, viz., an intelligent or volitional centre controlling the movements and actions of the body as a whole, and a sympathetic or non-volitional controlling the involuntary functions of its several organic parts.

2. The alimentary system, including the absorbent, which receives, digests, assimilates, and supplies to the body the pabulum required to maintain its growth and substance, and to replace the loss produced by the wear of its constant work. It comprises, besides the capillary absorbent system, the internal arrangements of the digestive organs, with their auxiliary glands in direct communication with the alimentary canal. The greatest and most important of these auxiliary glands, irrespective of the intestinal glands, are the liver, spleen, and pancreas.

3. The circulatory system, which, with the heart as its centre, receives from the alimentary system and distributes to the whole body its pabulum in the form of red or arterial blood, and at the same time collects in return the refuse in the form of black or venous blood. Both of these forms of blood supply certain glands or organs with the materials for their special secretions, and, meeting in the lungs, are there aerated and vitalised—the venous being transformed into arterial blood—by the process of combustion termed respiration.

4. The excretory system, which eliminates from the blood effete matters, derived from all parts of the body, in the form of secretions, some of which are discharged externally as of no further use, whilst others are discharged internally, and serve certain auxiliary purposes in the working economy of the body before their final expulsion through the channel of the intestines. This system is the most extensive and most important of the whole body; it is also the most complex in its parts and in their mutual relations towards each other and towards the other parts of the body. It comprises, besides the great abdominal secretory organs, such as the liver, kidneys, spleen, &c., all the glands of the outer integument or skin, as well as those of its great internal involutions—the alimentary canal throughout its length, and the air-passages of the respiratory system, or lungs.

5. The locomotory system, which comprises the whole frame of the body constituted by its osseous and fleshy parts, and which is the vehicle of the organs of its own life, service, support, and motion.

Every action of the body, whether of motion or function, is attended by wear and destruction of parts, and the removal of these worn parts is effected by the organs of the excretory system by a process of combustion evolving heat—the animal heat of the body. The amount of this heat is dependent upon the activity of the process of combustion, and normally is somewhat greater in the interior parts of the body than on its exposed surfaces, where it is reduced by dissipation into the surrounding air either directly or through the medium of the clothing. In the glands or organs of secretion this process of combustion is very active, and the heat evolved is disposed of in one of two ways—either by exhalation, as in the respiration of the lungs and skin, or by utilisation in the product secreted by the gland. In this latter case the heat becomes absorbed or latent, as in urine, bile, saliva, &c., &c. In the healthy state this process of combustion and evolution of heat is evenly balanced among the several organs, and so long as the harmony of their functions in the animate economy is maintained, the animal heat is evenly distributed in the body. But when this harmony is interrupted by derangement in the functions of one or more of the organs great changes are produced, local or general, proportionate to the severity of the derangement, and result in the state called fever, which is the sign of abnormally increased activity in the process of combustion—usually as performed in the capillary absorbent system, but sometimes as performed by one or more of some organs in consequence of its cessation or diminution in others. This state of fever is accompanied, or followed, by other changes according to the nature of the complications produced by the original derangement, and according to the organs specially affected thereby.

All the several systems above mentioned are intimately associated together and interdependent upon one another for the healthy being of the living body, and any injury to or derangement in the natural processes peculiar to one of them is felt and shared by the others in greater or less proportion according to the nature of their mutual relations in the bodily

economy, as well as according to the natural idiosyncrasy or recuperative powers of the individual; but, above all, in proportion to the transient or prolonged duration of the causes producing the original derangement of function, or to the transient or prolonged exposure of the individual to the operation of those causes. But they are not all equally or similarly liable to injury or derangement in the course of the ordinary vicissitudes or accidents of daily life—and most especially so as regards the locomotory system. The injuries and derangements of this system, whether mechanical or developmental, are of a different nature, both in their primary effects and subsequent results, to the injuries and derangements which are found to affect the other great systems co-operative and coparcenary in the living economy of the body. They are, therefore, in practice constituted into a separate department of the healing art distinguished by the term surgery.

As regards the remaining great systems of the body corporate above enumerated, some of them are more liable to injury and derangement from the effects of weather influences, in the course of the ordinary vicissitudes and accidents of life, than are the others. For instance, both the nervous and the circulatory systems, owing partly to their sheltered positions in the interior of the body, but mainly to the nature of their peculiar functional relations in its general economy, are less subject to the direct effects of the changes and risks alluded to than are the excretory and alimentary systems, which, from their situation on and in immediate connection with the external surface of the body, come more directly under the direct action of the various influences connected with vicissitudes of weather and climate.

The two former systems in the above category, in fact, suffer only in a secondary manner from the effects of the influences referred to, and usually as the result of functional derangement in the more exposed systems, with which they are in intimate and inseparably interdependent economical relations. The two latter systems, on the other hand, whose functional duties are of the first importance in the living economy, providing as they do for the purveyance and conservancy of the entire bodily structure, are from their exposed situations, in direct contact with and in direct access to the exterior of the body, peculiarly liable to injury and derangement in the due performance of the several normal processes special to the different organs which they comprise, and this by reason of their immediate exposure to the action and effects of external climatic influences, whether ordinary or extraordinary.

The functions discharged by the several organs of these two systems are, in truth, by far the most important of all in the animate economy, and upon the proper and harmonious performance of them depends the health, and indeed the very life, of the body. It is necessary, therefore, that we devote a few moments to the consideration of the part these functions play in the animate economy, and to that of the common or ordinary weather causes which operate to their derangement, in order to clear the way to an intelligent apprehension of the origin and nature of the disease with the investigation of which we are now principally concerned.

By the alimentary system, through the agency of a number of special organs or glands, of which the liver, spleen, and pancreas are the largest and most important, is performed the victualling of the body to which it belongs. In the stomach and intestines, by the aid of numerous organs or glands distributed in and about the entire length of the alimentary canal—an internal mucous surface continuous at either extremity with the external integument or skin—are digested and assimilated from the materials provided in the shape of food, solid and liquid, the various matters required for the pabulum

of the body, the refuse being discharged in the form of ordure, whilst the pabulum, under the name of chyle, is absorbed by a special set of vessels, and ultimately conveyed into the current of venous blood shortly before its arrival at the lungs, where it is converted into arterial blood. The healthy and facile performance of the processes of digestion and assimilation depends upon the nature and properties of the materials supplied for the preparation of the required pabulum, that is, upon the quantity and quality of the food. If the food is of the natural kind, wholesome, and in due proportion, the alimentary system disposes of it in the natural course with health to itself and the body generally. In proportion as the food—meat and drink—deviates from the required standard, so also does the alimentary canal—and secondarily the body dependent upon it—deviate from the natural state of health; and if, in this condition of deterioration, it be subjected to the vicarious discharge of other functions through the temporary derangement of some organ in intimate economic relation with it, then its recuperative power is still further taxed, and with consequences varying according to the surrounding circumstances and the state of the individual body.

By the excretory system is provided the general conservancy of the entire body, through the agency of a number of organs or glands which are arranged in different groups and positions according to the special nature of the effete matters they remove from the body. The absorbents and capillaries convey direct into the venous circulation, or through the medium of the lymphatic glands, the products of the decay of their several portions of the body. This venous blood is purified of some of these effete matters by a process of combustion in the lungs, but a considerable portion of it, derived from the whole interior of the abdominal cavity, is first passed through the liver, where the bile is excreted from it. The liver and the lungs are the only organs in the body which are supplied with venous blood for the purposes of excretion.

The special function of the lungs is to remove from the venous blood carbon and to supply in its place oxygen, and at the same time to aid in relieving the body of excess of moisture and some salts. These offices are performed by the process of respiration and its attendant combustion, in which carbon is removed in the form of carbonic acid, whilst oxygen is absorbed and water is removed in the form of vapour holding in suspension minute quantities of certain salts; with the result of converting the black venous blood into red arterial blood, which, however, still retains some other effete materials, which are removed from it by the other special excretory organs.

The special function of the liver is to excrete bile from the venous blood supplied to it. The bile is a highly carbonised fluid which contains several kinds of alkaline salts, and which subserves auxiliary purposes of digestion and assimilation prior to its ultimate discharge from the body with the fœces. The liver, in respect to its eliminating carbon from the venous blood, is an aid to the lungs in the conversion of venous into arterial blood.

The special function of the pancreas is to secrete the pancreatic fluid, which, like the bile, saliva, gastric juice, and other glandular excretions of the alimentary canal, is a requisite agent in the process of digestion.

The special function of the spleen is held to be—first, to serve as a reservoir for the abdominal venous circulation, so as to prevent local congestions during the process of digestion; and next, to aid in the process of sanguification by modifying the blood supplied to it, and to send to the liver by the splenic vein a blood distinguished by the large proportion of its white and small proportion of its red corpuscles, together with a large increase in its albumen and fibrin. This organ differs from the others in not possessing the

structure or attributes of an excretory gland, and holds a separate place in the bodily economy, apparently as an auxiliary organ in the processes of digestion and sanguification, analogous, probably, to the position held by the thyroid gland in its relations to the functions performed by the lungs. There are, however, some grounds for considering it in the light of an intermediate agent between the alimentary and excretory systems, as a reservoir for the temporary storage of excess of water in the blood, since it is prominently affected by the results of some forms of their functional derangement.

The rest of the conservancy of the body is performed by special organs, each of which removes from the arterial blood the constituents of its peculiar excretion. Of these organs the most important are the kidneys and the skin. The kidneys remove from the blood—in the form of various salts, suspended or dissolved in water, and voided in the form of urine—the products of the waste of the tissues of the body, as well as certain matters which have been introduced as food or medicine. Thus, whilst protecting the body against the accumulation of these deleterious matters, they at the same time relieve it of excess of water.

The skin performs a twofold office in the excretory system, partaking of the functions of the lungs as a respiratory organ on the one hand, and of those of the kidneys as an exhalant organ on the other. The skin, like the lungs, eliminates carbon from the blood by a process of combustion analogous to that of respiration; and, at the same time, like the kidneys, it excretes the sweat—a fluid which, like the urine, holds in suspension or solution various salts derived from the products of the wear of tissue, but which, instead of being accumulated in a special receptacle for occasional discharge like the urine, is ordinarily evaporated as it is exhaled, or, in the case of excessive production, flows upon the surface.

It is to be noted that all these excretory organs, excepting the spleen, elaborate from the blood various secretions or excretions which all bear a striking similarity in respect to their constituent matters, and that they are thus capable of vicariously acting the one for the other towards maintaining the normal condition of the blood on occasions of temporary derangement in the functions of one or other of the allied organs. And, as a matter of fact, it is the performance of this vicarious duty which explains the origin of the maladies or diseases which we are now concerned to investigate. In proportion as the efforts of one organ to supply temporarily the place of another are successful, so also is the constitutional disturbance slight and transient. But when—especially under the pressure of epidemic seasons or other causes prolonging the discharge of such vicarious office beyond endurance—these efforts fail, then in proportion to the extent of the failure is the constitutional disturbance rapid and grave.

With the lights now before us we may see our way to comprehending the nature of the symptoms which characterise the diseases I mentioned in an earlier passage in the relation of cause and effect, and perhaps be enabled to devise measures of a rational kind to mitigate their severity or to prevent their occurrence. We have seen that the maintenance and preservation of the body in a state of health, and indeed of life, is provided for by the purveying and conservancy arrangements of its alimentary and excretory systems—each comprising a very complex and intimately associated collection of organs, charged with the performance of different special functions connected with the assimilation of food-matters on the one hand, and the elimination of refuse matters on the other. The association of functions performed by these two systems is very intimate, the alimentation and the elimination processes

being mutually interdependent through the medium of the circulatory and the cognisance of the nervous systems.

The special functions of the organs of the excretory systems are directed to the elimination from the blood of effete matters, some of which are discharged externally as of no further use to the body, whilst others are discharged internally to subserve various auxiliary purposes in the living economy, mainly in connection with the alimentary system. The nature of these effete matters, I have stated, so far as relates to their chemical constituents, is very much the same as eliminated by the various great organs; so much so that the several organs eliminating them are capable of acting the one for the other vicariously on occasions of slight disturbance in the balance between their mutual functions; and, as a matter of fact, these organs on occasions actually do so act vicariously, and, up to a certain undefined extent, without serious inconvenience or injury, until the normal state of relations between their several functions is restored. But if this vicarious duty is prolonged or constantly repeated, or of a degree beyond the powers of the officiating organs to discharge conveniently, then a rupture in the mutual relations of these several organs takes place, and a process ensues for the readjustment of affairs, in which the alimentary system—the one most directly connected with the excretory in the functional arrangements of the living economy—also takes part.

The efforts made towards this end are attended by greater or less disturbance in the normal course of the functions discharged by the circulatory and nervous systems also, and this general derangement is marked by symptoms of various kinds more or less severe according to circumstances, and the issues are successful or futile, reanimating or fatal, also according to circumstances. The study of these symptoms and the intelligent apprehension of their indications, together with the complications they give rise to, is the occupation of the physician. And one result of this study has been to classify the symptoms observed under different denominations of disease, thus imparting to them a distinct individuality which in reality they do not always possess; at least, not until some particular organ or part has been so severely worked vicariously that it breaks down under the strain, and its structure becomes more or less seriously or irrecoverably damaged.

I have stated, further, that the healthy discharge of the functions pertaining to the alimentary system depends upon the wholesome quantity and quality of the food materials supplied to it; whilst that of the excretory system—which itself is largely auxiliary to the processes of alimentation—depends not only upon the normal discharge of the duties proper to the alimentary system, but also upon various influences more or less directly affecting its operations from without the body—usually through exposure to vicissitudes of weather and other similar influences. With respect to these influences, I noted that some of these great excretory organs, by reason of their exposed positions on and in direct communication with the exterior surface of the body, are more liable to be affected injuriously in the current discharge of their special functions by the action of weather vicissitudes than are those situated in more sheltered positions in the interior of the body.

Now, it is this very difference in the liability of the great excretory organs to be affected by weather influences which is the most common cause of disturbance in their harmonious co-operation for the performance of the general conservancy arrangements of the body to which they belong, and consequently of the vicarious activity of the unaffected organs in their efforts to carry on the extra duties thrown upon them by the check or cessation of

functions in those which have been thus affected. The skin and the lungs are the two great organs of the excretory system which are most liable to be affected by the direct influences of weather; and in the ordinary experience of life they are being constantly deranged by such causes in the current discharge of their special functions—usually, however, and under ordinary circumstances, with no more serious consequences than a mild or transitory ailment attended by symptoms indicative of the vicarious offices successfully performed by the liver and kidneys aided by the intestinal glands. On extraordinary occasions, on the other hand, such as epidemic seasons—and more especially when coupled with localities of recognised insalubrity, by reason of more or less grave defect in their sanitary aspects favourable to sudden and unwholesome changes in their climatic conditions—the derangements in the functions of these two great excretory organs, the skin more particularly, are not only of far more general and frequently recurring occurrence, but are also of a far more serious character; and this partly in consequence of the intensity of the influencing causes, and partly in consequence of their persistent duration, coupled very often with other circumstances unfavourably affecting the conditions of life in respect to food, clothing, and shelter. On such occasions, notwithstanding the resisting powers derived from habitude to climatic changes, to exposures, and to hardships, the strain upon these two organs is very great, and in a large proportion of cases not only more than these organs themselves can bear, but more also than can be remedied by the vicarious offices of the other great organs of the system. The consequence is, the production of a more or less severe and extensive derangement in the functions of the living economy, which manifests itself in the form of different symptoms or series of symptoms, varying in their character and courses according to the diversity of exciting and predisposing causes, as well as according to the complications arising from the unequal affection of the different organs.

The most important function performed by the lungs and skin is the elimination of carbon and water from the body in the form of carbonic acid and aqueous vapour, as before mentioned. Any check to the due performance of this function, and especially in respect to the skin—as by influences in the air (whether characterised by excessive heat and moisture, or by excessive heat and aridity, as the case may be) with which the surfaces of both the organs concerned in its performance are in direct contact—throws upon their vicarious agents among the internal organs a certain amount of extra work for the elimination from the blood of the carbon and water which the lungs and skin have failed to remove; and the performance of this extra work by these vicariously officiating internal organs is indicated by an increased activity in their own processes of watery exhalation, as by defluxion, or of combustion for the elimination of their special secretions, as by local hyperœmia. If these efforts fail to restore the normal state of affairs, then the capillary absorbent system partakes of the vicarious duty, and the increased activity in their normal processes of combustion is indicated by the state of body termed fever. If this also fail to restore the normal state of affairs, then various other symptoms appear, arising from the disturbance of functions thus produced in the general excretory system, and the further complications produced thereby.

It is no part of the present inquiry to enter upon an investigation of the causes and circumstances which determine the type of one kind of fever as distinct from that of another. But as one form of fever—that designated as malarious—bears many points of resemblance to the disease with the investi-

gation of which we are now more immediately concerned, namely, cholera, it behoves us to consider its ætiology somewhat in detail.

What, then, is malarious fever? I reply that, as the name implies, it is a fever produced by bad influences of the air, whether abnormally hot and moist or abnormally hot and dry, but more especially of the air when it is abnormally moist and its moisture is charged with noxious exhalations from decomposing animal and vegetable matter. Further, I say that these bad influences of the air operate by their direct action upon the functions normally performed by the lungs and skin. But in what precise manner they affect those functions I am unable to say, beyond enunciating the fact that they more or less seriously impede or check their due performance. At the same time, I consider that there are good grounds and valid for believing that such impediment or check is commonly produced in all the forms of malarious fever, excepting that of sunstroke or ardent fever, through the simple effects of alternations of temperature and moisture, accompanied by changes in the electric condition of the air, and more especially when the individual is exposed to such changes in the atmospheric conditions whilst in a passive or inactive state. In other words, I believe that "chill" is the prime and most common cause of the production of malarious fever by its action in arresting the functions of the skin and lungs, with consequences the nature and character of which have been briefly indicated in the pages immediately preceding.

The manner in which "*chill*" acts to check or impede the processes of exhalation and combustion normally accompanying the functional activity of the lungs and skin in their capacities, respectively, as eliminating organs may be aptly illustrated by a comparison with that in which "*water*" acts to check or impede the process of combustion as presented in the active form of fire. Indeed, if the manner of this action in the two cases compared is not identical in kind, differing only in degree of intensity, it is sufficiently akin in each—allowing, of course, for the variations incident to the action taking place in an animate body in the one case, and in an inanimate substance in the other—to serve the purpose of illustrating my argument.

Now, if water is brought into contact with fire—the manifestation of combustion in an intense and concentrated form—one of three results is obtained according to the circumstances determining them severally. (*a.*) If the water be the stronger, it at once quenches or extinguishes the fire. (*b.*) If the fire be the stronger, it recovers the first check or shock and dissipates or disposes of the offending water. (*c.*) If, again, the fire be the stronger in the first instance, but be subjected to repeated assaults by water during a prolonged period, its successive efforts—successful at first—gradually become less and less effective, and at length the fire expires under the continued assaults of the water—it splutters, smoulders, lingers, and finally goes out.

Precisely corresponding results are obtained under similar conditions in each case (with the difference that the action now takes place in substances in a state of life or animate existence) if "chill"—that is, *water* in the form of vapour condensed from the air by sudden change in its temperature from a higher to a lower degree—is brought into contact with the fire—excessively weak and diffused though it be—produced by the combustion attending the functional processes performed by the skin and lungs. Thus (*a.*) if the "chill" be the stronger, it at once more or less seriously checks, or may be for a time altogether stops, the process of functional exhalation and combustion in these eliminating organs. (*b.*) If the organs producing this combustion be

the stronger, they recover the check caused by the chill, and, disposing of it, resume their normal functional course. (c.) If, again, these organs be the stronger in the first instance, but be subjected during a prolonged period to repeated assaults by "chill," their successive efforts—however successful at first, or even for some time longer with the assistance of allied organs acting vicariously on their behalf—gradually become less and less effective, the other excretory organs associated with them in the functional services of the body also to a greater or less extent partake of the derangements thus produced, and, finally, the whole system dependent upon their economic services suffers, the constitution is disturbed, its functional services are deranged, the body withers, its life lingers awhile, and finally expires.

I have stated before that the most important of the functions performed by the skin and lungs is the elimination of water and of carbon (an effete substance) from the blood, in the form of exhalation of water, vapour, and of carbonic acid, by a process of combustion carried on in the air-vesicles of the lungs and the sweat-tubes of the skin. The action of chill upon this process in these organs is to check or altogether stop it, and the consequence is that the water and the carbon, which should have been removed from the blood by the lungs and skin, remain in the blood in superabundant quantity until removed by the vicarious action of other organs, or by the lungs and skin themselves on recovery from the first check or shock. The first effect upon the body of this unremoved water and carbon circulating in the blood is the production of headache, nausea, vertigo, and other symptoms of malaise, just such as are produced by exposure to the fumes of burning charcoal in a close or unventilated chamber. In the course of the natural efforts made by the living body to readjust the derangements thus produced the allied excretory organs in the interior of the body come to the rescue, and by their vicarious offices, in addition to their own regular duties, may succeed in clearing the blood of its excess of water and carbon, and restoring the normal state of functional affairs. These efforts are naturally attended by more or less marked divergence from the usual routine, and the nature and degree of such divergence is indicated by symptoms of illness which produce greater or less constitutional disturbance. If they fail, however, to secure a restoration of the normal state of affairs in respect to the carbon, then the capillary absorbents commence activity, and, it is believed, convert the superabundant carbon in the blood into carbonic acid at the expense of the tissues around; the carbonic acid thus formed then passing along with the venous blood to the lungs and skin, and there being exhaled without further functional process. The activity of the capillary absorbents in this process of combustion is marked by a greatly increased temperature—the state of fever.

In the case of ardent fever or sunstroke the nature of the weather influence is different, but its ultimate result in the derangement of the functional offices performed by the lungs and skin is the same. In this case the check to the elimination of carbon from the blood is not by a quenching as in "chill," but by quenching through deficiency of the requisite material for the combustion by means of which the carbon is normally removed in the form of carbonic acid; in other words, by a deficiency of oxygen, the result of abnormal rarefaction of the air by excessive heat. The symptoms produced under such circumstances are just such as those which are observed to occur under exposure to a rarefied air at extraordinary altitudes, especially in hot weather, when the enervating effects of heat come to operate, in both the cases compared, in addition to those of the rarefied air itself. To pursue the simile adopted in the case of "chill," we may in this case compare the action of great heat and aridity

of the air upon the combustion process on the lungs and skin to that of the sun's rays upon a burning fire. In both instances the check or stoppage of combustion results as a consequence of diminished material for the continuance of the process, and, as regards the animate organs under consideration, leads to accumulation of carbon in the blood, with the constitutional derangements already referred to.

In the course of these several efforts of the body to right itself numerous complications may and often do arise. Their study and intelligent apprehension is the duty of the physician, and I am bold to hope that with the key here furnished, if skilfully applied, may be unlocked the at present shut-up knowledge as to the causes and symptoms of most of the diseases known to be produced by the action upon the body of weather or climatic influences. For I have reason to believe that, from the records contained in the Annual Sanitary Administration Reports for the several provinces, as well as in the medical literature relating to this class of diseases in India, it can be conclusively established as a fact that all the various forms of fever, excepting the exanthemata commonly met with in this country, owe their origin to the functional derangements produced by the effects of weather influences as above indicated, and that their subsequent stages and sequelæ are varied, and become endowed with distinctive types of pathological symptoms and changes, merely as the results of the effects of concurrent contingent circumstances, the operation of which under their several conditions of action can be intelligibly explained by the very nature of those circumstances themselves in each individual form or type of fever.

But, however this may be, the grounds upon which I base my belief that "chill" in the one case, and "heat" in the other, is the most common exciting cause of these maladies, respectively, are furnished by the fact that malarious fevers are found to prevail with a periodicity corresponding with that of the annual seasons of greatest change in the weather elements, namely, the spring and autumn, and, moreover, with a periodicity corresponding, at least in the Punjab, for which province the statistics have been tabulated, with the triennial cycles of rainfall—a peculiarity in which they coincide with cholera—whilst sun-fever or sunstroke is found to prevail with a periodicity corresponding with the season of highest temperature. Further, the grounds for this belief in the origin of malarious and sun fevers from the effects of atmospheric influences are supported by the character of the initial symptoms of these fevers—symptoms which I conceive can be intelligibly and reasonably explained as the results of derangement in the functions of the lungs and skin, and consequent upon exposure to influences of the weather; although, at the same time, I freely grant that the subsequent symptoms and ulterior course of these fevers may be, and commonly are, very largely affected and controlled by collateral circumstances connected with the general health standard as this is influenced by the sanitary aspects of locality and the life-conditions of the population, circumstances which—especially in epidemic seasons—conduce to a more or less severe aggravation of the functional derangements originally produced by climatic influences alone.

And here I must note that the derangements in the functions of the skin and lungs produced by weather influences are not always of the same kind or followed by a similar train of symptoms. On the contrary, I believe that there are good grounds of evidence to prove that these derangements are sometimes characterised by excess of functional action of those organs, and at other times by defect, in the former case the result being the production of functional ailments of the alimentary system indicated by various forms of

dyspepsia, and in the latter malarious fever in its several forms and varieties. However, be this as it may, the point now claiming our attention is the manner in which malarious fever is produced by the action of weather influences, controlled very largely by local conditions of soil, upon the functions of the skin and lungs. I have already referred briefly—so far as is necessary for my purpose—to the physiology of the human body, that is, to the knowledge of the healthy action of its several functional parts or systems, and it would have been desirable here to dwell somewhat at length upon its pathology, that is, the knowledge of the causes, both proximate and remote, which produce unhealthy action of these systems, or disease—at least so far as relates to the maladies now engaging our attention. But to do so would require more time and space than is at my disposal, and I must therefore limit my observations to a brief summary and general treatment of the subject.

Experience teaches us that the simplest form of malarious fever is that of febrile malaise; the next severer form that of intermittent fever, with more or less lasting injury to the spleen; and the severest form that of remittent fever, with more or less serious affection of the liver and intestinal glands. Each of these kinds of malarious fever is met with in different degrees of severity and under different forms of type; but they are only gradations of one and the same ailment, dependent for their divergence of symptoms upon the complications produced by the sustained and more or less ineffectual efforts of the internal excretory organs, vicariously officiating to readjust a prolonged repetition of derangements in the functions of the skin and lungs; and, in practice, they are constantly seen to pass from the milder to the severer forms by successive stages. Here I can only in the most cursory manner briefly allude to the distinctive characters of the several kinds. And first, of those produced by "chill." The first kind, or febrile malaise, is distinctly recognised as the result of a check to the functional action of the skin and lungs, and is generally very sudden in its access, though occasionally it is observed to come on gradually. Its origin can be almost always recognised as the consequence of exposure to chill, or damp, or wet. It is marked by a general lassitude and aching of the body, and sometimes the head especially; by an abnormally high temperature, but to no great intensity, with a dry skin and hot breath. The ailment usually is mild and transient, the body righting itself by a natural diarrhœa, or diuresis, or diaphoresis, without any considerable disturbance of the great eliminating organs; the process of combustion, which was temporarily checked in the sweat glands and respiratory cells, being transferred for the time being to the capillary absorbents—the agents by which the nutrition of the tissues is performed—as indicated by the general rise in the general temperature of the body. Under circumstances involving repeated or prolonged exposure to the causes producing this malarious febrile malaise—as by residence in a malarious locality—the oft-repeated and long-continued vicarious offices thus thrown upon the liver, spleen, and kidneys result in a more or less profound derangement in their own natural functions, accompanied with greater or less organic injury, as indicated by hepatic congestion, splenic engorgement, and lumbar pains symptomatic of the strain upon the kidneys; and this leads to a general deterioration of the health, without necessarily producing the development of the next severer form of the malady—ague or intermittent fever. Such forms of the disease, however, are usually confined to particular localities favourable to their production by well-known defects in respect to their sanitary aspects. Apart from

such locally endemic prevalence, however, this kind of fever—febrile malaise—although it commonly presents itself thus independently and often without ulterior consequences, is nevertheless very often, and especially so in epidemic seasons, the precursor or first stage of all the four forms of fever which I have mentioned in an earlier passage as owing their origin to climatic or atmospheric influences, namely, malarious fever, catarrhal fever, sun-fever, and choleraic fever. In each case the determination of the form to be assumed by the next severer stage depends upon various, and for the most part ill-understood, circumstances connected with the character of the influencing weather elements. But we are taught by experience that, if the derangement in the functional action of the skin and lungs produced by these influences determines to the internal involution of the outer integuments—to the mucous surfaces of the respiratory passages and the alimentary canal—then we have a catarrh or flux from these surfaces to compensate the check in the deranged organs, in the form of influenza or pulmonary catarrh in the one case, and in the form of diarrhœa or intestinal catarrh in the other. Usually these maladies, with ordinary care, tend to resolution, but they are liable to serious complications by accidents in the surrounding circumstances, and in epidemic seasons prevail in severely aggravated forms, which often prove very rapidly fatal, death resulting in less than twenty-four hours.

If, on the other hand, the functional derangement of the skin determine to the other great excretory organs, we have a state of constitutional disturbance very different in its initial stage from that observed in the case of the mucous surfaces, and varying also according to the organs most prominently affected, and also according to the character of the surrounding influences, but in all cases attended with fever—a process of combustion taking place at the expense of the tissues of the body. In practice we meet with the fever thus produced in two very different forms, known by the names of sunstroke or ardent fever and ague or algid fever respectively; and again in two other very different forms known by the names of bilious fever or remittent fever, and cholera or choleraic fever. As regards the two first, generally, each kind is gradual in its access, and with a common similarity of symptoms at the outset. This similarity, however, quickly disappears, and each fever becomes distinguished by its characteristic symptoms—the first, or sunstroke, by a more or less intense excitement of the excretory system generally; the latter, or ague, by a more or less intensely pronounced depression of that system; in the one case the blood being surcharged with carbon, in the other with water. In each kind the attack not infrequently comes on with extreme suddenness and violence, and occasionally proves fatal with a rapidity equalling that of the severest form of cholera, and more commonly so in cases of the severer forms of sunstroke.

Although these two fevers present symptoms so different from each other, still it is by no means uncommon to find cases of the milder forms of sunstroke passing into ague; and it is an interesting subject for investigation to ascertain the causes which determine to such very opposite symptoms in the outset of these two forms of fever. In the severer forms of sunstroke the onset is by a sudden and violent outburst of ardent fever, attended by grave constitutional disturbance; there are a pungent heat and dryness of breath and skin, and a florid turgescence of the capillary circulation, with intense headache and more or less severe vomiting and purging. These symptoms may, after an interval, turn towards resolution by a sudden and profuse perspiration, or they may gradually abate with a moderate continuance of the

febrile state. But in the severer and generally unfavourable cases the outburst of fever is quickly followed by shock to the volitional nervous system, or with rigors and spasms, or with convulsions and apoplexy; and death ensues by coma.

In the severer forms of ague, on the other hand, the onset of the attack is by a sudden and complete arrest of the functions of the excretory system generally, with a determination of the circulation to the interior of the body —to the abdominal organs especially. The symptoms present the very opposite characters of those observed in sunstroke. There are a cold clammy skin and a chilly damp breath, and a livid shrivelling of the capillary circulation, with profound depression of all the vital functions; sometimes attended by vomiting and purging, but usually only by violent shivering; occasionally attended by convulsions or followed by syncope, which often ends in death. In the severer forms of attack the shock to the sympathetic nervous system is paralysing in its effects; the process of combustion is in temporary abeyance throughout the exterior surface of the body, and a sense of cold pervades the entire system, although the temperature of the interior of the body may be all the time greater than natural; the blood stagnates in the great excretory organs, and moves sluggishly through the circulatory system unaerated, thus imparting to the skin its livid hue. These symptoms endure for a while, and then a reaction sets in, violent in proportion to the original shock; the paralysis of the sympathetic nervous system passes away, the excretory organs resume their functions, and the circulatory system, beginning to move, very speedily acquires an intensity of excitement equalling that observed in sunstroke, and with precisely similar pungency of heat and florid plethora. These symptoms in their turn terminate in a profuse perspiration which ushers in resolution, and the patient is left free of ailment until the recurrence of the attack. In the severer forms of ague the cold stage is marked by a train of symptoms which very often are undistinguishable from those of the algid stage of cholera, although usually they are not so fatal as the same stage of the latter disease. But this difference may merely mean that the fatal cases of ague in the algid stage are called cholera, whilst those which recover are called ague; and my own experience in this country decidedly confirms this view.

The main difference between the characters of the attack in the severer forms of sunstroke and ague appears to be that in the former the check to the functions of the skin and lungs—influenced, no doubt, by some effect of the direct action of the solar rays or the electricity in the air—is immediately followed by intense excitement of the circulatory and excretory systems, corresponding to the ardent or hot stage of ague, but without the prior occurrence of the algid or cold stage of that malady, whilst, as in ague, it is terminated (in the ordinary course) by a profuse reaction of the skin; whereas in the latter the check to the action of the skin and lungs—influenced doubtless by some effect of the direct operation of the combined forces of temperature, humidity, and electricity in the air—is immediately followed by a more or less profound shock or paralysis of the sympathetic nervous system, indicated by corresponding degrees of depression or arrest of function in the excretory and circulatory systems generally; these results being succeeded by a more or less violent reaction—in proportion to the original shock—with symptoms corresponding to those of ardent fever, and, like them, terminating in a profusely resumed activity of the skin.

In ague the injury done to the internal excretory organs—the spleen, kidneys, and liver, more especially—by this violent and, as the case usually

is, repeated disturbance of their functions, although generally not so immediately or so early fatal as in the severer forms of other malarious fevers, is nevertheless of a more serious and lasting nature, and induces a proneness to frequently repeated and long-continued recurrences of similar attacks, each attack still further damaging the organs principally affected, and, through them, the bodily health generally, especially—most especially—so long as the individual remains exposed to the exciting causes, whether of climate alone, or climate coupled with unfavourable (to health) local conditions, more particularly in respect to the soil moisture.

Such, in brief terms, are the main features of the symptoms characterising typical cases of the severer forms of these two fevers. In practice, however, they are met with in a great variety of milder forms merging into each other, and not infrequently passing into either remittent fever or choleraic fever.

In respect to these two latter diseases, the first consequence of the derangement in the functional action of the skin and lungs is not commonly—except in epidemic seasons—marked by the same suddenness and violence of symptoms as is frequently observed to occur in cases of ardent fever and algid fever—of sunstroke and of ague—as above described. As regards remittent or bilious or yellow fever, the disturbance created among the internal excretory organs by derangement in the functional duties of their great external allies, the skin and lungs, is of a more gradual, prolonged, and serious nature than in the ordinary cases of ardent fever or of algid fever; and this as the result apparently of an unsuccessfully sustained effort to readjust affairs under unfavourable circumstances, such as either repeated exposures to the causes of derangement of skin functions or defect in the individual state of health; in consequence of which one or more of the great internal excretory organs—generally the liver first and the intestinal glands afterwards—signally break down in the discharge of the vicarious duties thrown upon them by the protracted arrest of action in the functions of the skin and lungs. These results produce a variety of complications and accidents in the course of the disease, which are controlled as to the type they assume by the influences of epidemic season and other collateral circumstances referable to the actual surroundings of the sufferers—especially in respect to overcrowding, shelter, food, and clothing.

In some epidemic seasons—particularly if associated with famine distress—remittent or bilious fevers assume a very deadly type, and, if at the same time or season of their prevalence epidemic catarrh or choleraic catarrh be also abroad, then they rapidly pass into pleuro-pneumonia or malignant cholera, as the case may be. Generally, however, the simple and uncomplicated form of remittent fever is no more than the process involved by the natural efforts of the body to right itself and readjust the disturbed balance of functions in the excretory system resulting from an arrest or check in the functional action of the skin and lungs; and these efforts, through the aid of the alimentary system also, are usually, or under ordinary circumstances, successful.

As regards choleraic fever—the subject with which we are now most immediately concerned, and for the due apprehension of which the preceding allusions to the different forms presented by malarious fevers have been made—I find it easy, in the face of the diversity of opinions held as to the nature and causes of the disease, to assign it a recognised place among the list of malarious fevers. And, expressing my own opinion and conviction, I have no hesitation in classing the disease commonly called cholera as a choleraic

fever with the other forms of malarious fever which I have alluded to in previous passages as owing their origin to the effects of climate and atmospheric influences acting, in the first instance, upon the functional offices performed by the skin and lungs, and, in the next, through them upon the functional offices of the other great excretory organs which are associated with the functional arrangements of the alimentary system, and chief amongst them upon the liver.

When we calmly and dispassionately consider in detail our experience of the cholera disease—whether as observed in its sporadic manifestations of activity or its epidemic outbursts of prevalence—in countries possessing very different climates and very different physical aspects, as well as very different conditions of prosperity, and compare the results thereof with the evidence forced upon us by the statistics recorded by different and independent observers and reporters in all parts of India during the past twenty years, as is brought together in one view in the pages of the preceding history of the disease in India during that period, I for one cannot, despite the diversity and contrariety of opinions expressed by the different writers, but come to the conclusion, based upon the evidence recorded by themselves, that cholera, in India at all events, is a disease which is entirely dependent for its origin upon the effects of atmospheric influences acting upon the body through the skin and lungs—as in the other malarious fevers I have enumerated—aided and controlled, no doubt, by the health state of the individual and the immediately predisposing cause of the attack, and controlled in respect to mildness or severity of prevalence by peculiarities of epidemic season. Further, I have reason to believe that it is the same also in European countries and in America, judging from the evidences furnished by the records of the development and comportment of the disease in those countries as met with in medical literature. The great difference in character of the prevalence of the disease in those countries and in India is the striking regularity of its periodical recurrence in epidemic form in India. But this peculiarity is only the more confirmatory of the view above expressed regarding the dependence of the disease for its origin, as well as its epidemic development, upon influences of weather; for in no other country with which we are acquainted is the succession of seasons marked by meteorological phenomena of such magnitude and violence, or by such sudden and great changes in the conditions and states of the weather elements, and with, also, such regularly recurring periodicity, as they are in India.

I have explained in an earlier passage that the statistics dealt with in my present investigation of cholera in India refer only to the deaths recorded from that disease when it presents itself in its severest and most fatal form—a stage of the malady which in no way represents the true nature of cholera nor the extent of its prevalence; for, as was then mentioned, the disease is acknowledged by the highest authorities on the subject to present itself in three distinct forms or stages. These stages are—(1.) Malaise—attended by dyspepsia, with slight looseness of the bowels and more or less troublesome flatulence, indicating derangement of the hepatic functions and change in the character of its special secretion, the bile, by which that important element in the process of digestion loses its antiseptic properties and acquires others of a more or less cathartic nature. These changes in the constitution of the bile are indicated by the putrefaction of the food in the stomach and intestines producing flatulence, and by the purgative action of the bile increasing a naturally remedial looseness of the bowels; and they are brought about as consequences of the vicarious offices of the liver in a natural effort to readjust the disturbance

of functions produced by a check to the action of the skin and lungs, caused by the effects of weather influences. This form of the malady occurs at all times and all seasons, but varies greatly in the degrees of its severity in different seasons, and especially in epidemic seasons. Usually the ailment occurs as a mild and transient disturbance of the functions of the excretory and alimentary systems, and, under ordinary care, soon rights itself without serious inconvenience. But in epidemic seasons, owing to the intensity and prolonged duration of the exciting causes, it often shows a tendency to assume increased severity of symptoms, more especially under neglect or careless treatment of the body whilst in this state, such as by improper diet and improper exposure to weather, especially if coupled with fatiguing or exhausting exercises. Under such circumstances the mild symptoms above described very often rapidly assume a greater severity, and occasionally run on into the most aggravated form of the disease, known as malignant cholera, just as an ordinary cold or catarrh, under similar circumstances of mismanagement, very often passes into the severer form of pulmonary catarrh or bronchitis, or, in seasons of epidemic influences, assumes the graver form of pleuro-pneumonia.

(2.) Diarrhœa—usually described as dyspeptic or bilious diarrhœa, and in epidemic seasons as premonitory diarrhœa, but which I have spoken of as catarrhal or mucous diarrhœa. This stage of the disease is merely an aggravation of the symptoms of the first, as the result usually of epidemic influences of weather acting with greater severity or greater persistence, but not infrequently also as a consequence of neglect or careless treatment of the earlier stage. It is of common occurrence at all times and seasons as the result of exposure to cold and damp, more especially if this exposure occur suddenly after habitude to the opposite conditions of weather. It often prevails also as an epidemic, and sometimes with a gravity of symptoms merging into the next severer stage. In its ordinary uncomplicated form it is not usually a fatal disease, nor does it cause much constitutional disturbance; if any, there is seldom much fever, and the free flow of bile, aiding the natural discharge of excess water in the blood by copious painless mucous and watery fœcal motions from the bowels, is followed by a sense of relief to the system and a feeling of buoyancy which is hailed as a good omen after the preceding term of malaise and depression. These hopeful feelings, however, often prove most fallacious, for they lead to a neglect of the ailment, which is always perilous, and in epidemic seasons fatally so.

This stage originates, like the first, in derangement of the functional action of the skin being reflected upon that of the liver and intestinal glands, which act vicariously in the effort to readjust matters, but apparently with greater and more stimulating changes in the constituents of their secretions, which now become actively purgative, and produce, or intensify, a catarrh or flux from the mucous surface of the small intestines. This flux constitutes the distinguishing character of the alvine discharges, and continues independently of any further action of the bile as the result of a catarrhal state assumed in the effort to rid the blood of excess water by the intestinal mucous membrane. This is the form of the disease to which the term cholera—bile flux—most appropriately applies; for in the severer stages there is usually retention of bile, with increased catarrhal flux. However, in this bilious stage the diarrhœa is apt to be seriously aggravated by neglect or accidents of the surrounding circumstances, and in epidemic seasons often passes with extreme suddenness into the graver forms characteristic of the third stage, or malignant cholera, apparently as a consequence of the direct effects of weather influences alone, though even in these cases errors in diet

and neglect of ordinary protection of the body against the effects of chill by draughts, &c., are almost always observable as a predisposing cause.

(3.) Cholera—the term restricted to the malignant form of the disease characterised by the symptoms of serous or hæmorrhagic diarrhœa and suppression of urine—properly includes all the forms of the disease; but, for convenience of description, it is applied only to the severest forms, which present very often a train of symptoms marked by a close analogy to those of ague, if, indeed, they are not merely another form of that disease. In these severer forms of cholera the attack usually supervenes in more or less rapid succession upon the milder forms; but occasionally, and in epidemic seasons more frequently, the onset is with extreme rapidity, and without the occurrence of the premonitory diarrhœa stage, though in all such cases, as a rule, there is found to be some previously existing dyspepsia, or hepatic derangement, or febrile malaise. Whether gradual or sudden, however, the attack in its first onset is precipitated by a variety of causes tending to overtax the functional offices of the excretory and alimentary systems, as by errors in diet (meat and drink), or by careless exposure to weather influences (draughts, chills, damp, &c.), more especially during sleep or a state of passive repose, or by fatigues, privations, and exhausting exercises (long marches, fastings, debauchery, &c.) All these causes are much more active in their operation upon subjects rendered susceptible to them by previous suffering from dyspepsia, or more or less chronic derangement of the hepatic functions, or from the effects of malarious fevers, &c., than upon others in the enjoyment of sound health. But occasionally, even in the healthiest and strongest individuals whose system may chance to be temporarily, and to an extent scarcely perceptible to themselves, deranged by one or other of the causes above indicated, the onset of the attack is extremely sudden and severe, and with a violence of symptoms such as attends the operation of a virulent and deadly poison.

In all cases of cholera, however, whether of gradual or sudden access, the attack is ushered in by a revulsion of the ordinary sensations, which is attended by a rapid succession of hot and cold flushes; these are quickly followed by giddiness or faintness, with fluttering at the heart and a small, quick, tremulous pulse, accompanied by a peculiarly distressing sense of oppression or sinking away at the pit of the stomach and intense nauseating headache. The features now become suddenly pallid and pinched, and then quickly suffused with a more or less deep lividity and pervaded by an expression of anxiety and alarm. The breath is chill and dank, the voice thick and husky, and the skin becomes cold, clammy, and shrivelled. At the same time with these symptoms of sudden shock to the system there is a flow of bile into the duodenum, which is often perceptibly felt by the patient in the form of a thin hot jet, and a feeling of deadly coldness and sinking of life comes over the body, attended sometimes by a distinct shivering fit as in ague, whilst a burning heat rages within the abdomen, and there is intense thirst. These symptoms are attended, or quickly followed, by vomiting of an acrid bilious matter, and by more or less sudden and active purging; the first stools being loose and fœculent, with an excess of fatty and mucous matters; the succeeding ones more copious, watery, frothy, and serous, or hæmorrhagic, and following in rapid succession, with little or no pain, but according to their suddenness and severity producing a greater or less prostration of the vital powers and loss of pulse. The vomiting is not in all cases present, and in some is very slight; but in most instances of the severer attacks both vomiting and purging are very prominent symptoms, and are

attended with severe cramps of the limbs and stomach, and indeed often of the whole body; together with extreme distress and restlessness, and profuse cold sweats. At this stage of the malady a peculiar musty, fishy, and nauseous odour pervades the body and its discharges; it is the smell of blood serum, and is the same as that which pervades slaughter-yards where many animals have just been slaughtered.

These symptoms, after the outbreak of the perspiration, may gradually subside, the pulse recover itself, and heat return to the surface, when a paroxysm of reactionary fever, as in the hot stage of ague, occurs, and in its turn gives place to a renewed outbreak of sweating, after which the body recovers its previous state with remarkable rapidity. In many cases, however, the reactionary fever is prolonged for several days, and often leads to a variety of complications—suppression of the functions of the kidneys being one of the most prominent—terminating in death.

Or, these symptoms may pass on and produce the state of collapse, the internal heat all the while remaining pungently and oppressively intense. In the state of collapse the coldness of breath, blueness of countenance, and lividity of the skin which commenced to show themselves at the first shock of the onset are greatly intensified; the pulse is lost, or trembles as a thin thread; the voice also is lost, or becomes husky and stridulous; the eyes sink deep back into their sockets; the skin becomes wrinkled, deathly cold, and clammy, and, though the intellect is intact to the last, a listless drowsiness from sheer exhaustion of the vital powers sets in, and death quickly closes the scene. The internal heat of the body, however, remains as intense as ever up to the last, and continues for some hours after life is extinct.

Such is the common course of symptoms observed in the severer and fatal forms of cholera; but they vary much in different cases. Sometimes the onset is marked by a sudden shock or syncope following very quickly upon a brief period of rapidly succeeding chills and flushes, and without either vomiting or purging; and this syncope may, on rare occasions, at once prove fatal without the development of further symptoms. In the state of syncope or collapse the deathly pallor at first suffusing the features is quickly replaced by intense lividity, and the eyes sink back, giving to the countenance a ghastly expression. The skin and breath are at first cold and clammy, and the voice either lost or heard only in creaky whispers; but the abdomen is intensely hot, and this heat soon spreads to the skin and persists as an ardent fever until death, and after death continues for several hours concentrated in the abdomen, on the inner side of the thighs, and about the armpits. These forms of the attack are extremely deadly, and usually prove fatal in from six to twelve hours from the first onset. But in the majority of attacks, even of the graver kinds, the symptoms do not run to such extremity, though they present themselves in various degrees of severity approaching it. Not infrequently the attack simulates an ague fit. It comes on after more or less prolonged malaise, immediately after the occurrence of a sudden nausea and faintness, and is attended by more or less of vomiting and purging. It then runs the regular paroxysmal course of ague, but with more or less active purging and distressing restlessness, accompanied by cramps and thirst in the cold stage. This form of cholera is of very common occurrence in epidemic outbreaks of the disease, and is met with in a great variety of degrees of severity, the cold stage in some cases lasting for several hours.

But whatever variety of symptoms and degrees of severity these graver cases of cholera may assume in their distressing and short-lived duration,

they always commence in the same way, namely, with a preceding train of milder symptoms, being overtaken by others which produce a sudden shock to the system as if from the action of a virulent poison; the subsequent symptoms being only aggravated forms, with their natural consequences, of those which I have described as marking the two milder stages of the disease, namely, malaise and diarrhœa. In these two earlier and milder stages, the symptoms attending the intestinal defluxion were shown to be the result of some injurious alteration in the constituents of the bile, which, by the irritant qualities thus communicated to it, produced a laxative effect upon the mucous membrane of the intestines in the case of malaise, and a cathartic effect in that of diarrhœa; the difference of action in the two cases being only one of degree, and according, one may very naturally conclude, to the irritant quality of the altered bile being greater in the one case than in the other. In cholera, the severest stage of the disease, by parity of reasoning, we may consider the altered character of the bile to be of a still more irritating quality, and by which it acquires the properties of a hydragogue. What is the nature of the alteration in the normal constituents of the bile which renders it capable of producing these successively severer forms of action upon the mucous membrane of the small intestines whilst it is in a catarrhal state from the effects of weather influences I have no knowledge. And why this altered bile should at one time produce the purgative effects of rhubarb, at another the cathartic effects of jalap, and at another again the drastic effects of elaterium, I cannot precisely define. But I can perfectly comprehend how easily an injurious change may be effected in the quality of the normal constituents of the bile, as a consequence of derangement in the functional duties of the skin and lungs (and of the latter, possibly, to a greater extent in these severe forms of the disease than in the milder), owing to the well-known frequency with which such derangements are shared also by the liver as the most prominent of the great excretory glands which on such occasions officiate vicariously for those temporarily arrested or checked in the due performance of their normal functions by climatic or atmospheric influences. Further, I can fully understand also how the operation of such influences may produce varying degrees of these functional derangements, as well as of the catarrhal state of the intestinal mucous membrane, according to the mildness or intensity of their occurrence and the transient or persistent nature of their prevalence.

In this view of the case, we can intelligently explain the various degrees of severity in the train of symptoms distinguishing each of the three typical stages of the cholera disease, which I have above briefly described as being due to varying degrees of derangement in the functions of the organs directly exposed to the action of weather influences; these derangements being either slight and transient or severe and prolonged (and, in the latter case, liable to sudden and fatal aggravation) according to the nature and extent of exposure to the influences indicated; but in all cases subject to variation by numerous controlling circumstances quite independent of the original exciting influences—as by unfavourable (to the general or individual health) conditions of locality, of food, clothing, shelter, occupation, habits, &c. And that this explanation is an intelligible and reasonable one is borne out by the fact of the epidemic prevalence of these forms of the disease independently—to a certain extent—of each other in different epidemic seasons, as well as in a sporadic form at all times and seasons. In some epidemic seasons we find the mildest form of the disease, or that of cholera malaise—with occasionally more or less prominently dyspeptic and febrile accompani-

ments—to prevail. In other seasons, the severer form of epidemic or choleraic diarrhœa is observed to prevail with a frequency much greater than that of the other forms, and not uncommonly to be complicated with hepatic derangements of a severe kind, tending to the development of remittent fever; whilst in other seasons again, the severest form, or that of cholera itself, with very often a marked tendency to assume the form of ague or algid fever, is that which by its prominence and frequency distinguishes the character of the epidemic.

In either case the symptoms in their origin are of a common type, and differ only in the degrees of their severity, and the consequent complications which the greater degrees of severity give rise to. I may illustrate my argument by comparing the different degrees of action of the bile in these three stages of the cholera disease to those of the different degrees of action of well-known purgatives, according to the dose administered, upon the mucous membrane of the intestines primarily, and upon the system as a whole secondarily. Let us take, for example, the drug elaterium, which in very small quantities acts upon the intestines as an irritant poison of the purgative kind. The ordinary dose (a fraction of a grain) of this vegetable extract acts as a drastic hydragogue, a smaller dose as a brisk cathartic, and a smaller still as a mere purge or laxative. But if the drug be administered in an excessive or poisonous dose, then it produces an aggravated form of purging, attended with vomiting and other symptoms of constitutional disturbance which are in no way distinguishable from those of the collapse stage of cholera.

From this it is not meant to be inferred that the drug here cited is in any way, as respects its chemical constituents, connected with the nature of the changes which may take place in the bile, as a consequence of functional derangement under the operation of the influences indicated, so as to render it a mild, or an active, or a virulent purgative, as the case may be, and with the qualities of the last capable of producing the state of collapse; because many other drugs also act as irritant poisons of a purgative kind, and also in poisonous doses produce a state of collapse with shock to the system similar to that observed in the severer forms of cholera. In fact, collapse is collapse, and the symptoms producing and characterising that state of profound shock to the system are the same in their tendency and results by whatever kind of poison they may be brought about, although they vary somewhat in character of special symptoms as produced in greater prominence by different poisons.

But what is meant to be expressed here is, that the bile, which under certain conditions of the derangement of the skin and lung functions is so changed in its properties as to acquire the quality of a mild or a brisk purgative, as the case may be—and this position is acknowledged by the medical profession in the treatment of diarrhœa attributed to indigestion and hepatic derangement consequent upon the effects of exposure to chill or damp—may, and I assert does, under certain circumstances produce an aggravation or prolongation of those functional derangements, acquire a certain intensification of that same quality, thus constituting it a drastic hydragogue; and with the result of producing the symptoms common to the action of other substances endowed with properties of a like purgative kind. How, or under what precise circumstances, these varying degrees of change in the bile are brought about I do not profess to explain. It is enough for us to accept the fact, that the bile is capable of undergoing degrees of change in its normal constituents according to the degrees of intensity of the causes producing that change. In other words, we can understand that these varying degrees in the action of the bile may well be dependent upon varying intensity and

duration of weather influences, producing functional derangement of corresponding intensity and duration.

This view of the question, I conceive, is capable of explaining in a manner acceptable to reason all the varied phenomena of the symptoms presented in the various stages of the cholera disease—which is truly, as the name implies, a bile flux, acting upon intestinal catarrh, which itself is nature's means of ridding the blood of excess water—and of explaining more particularly those sudden and violent attacks of the disease which so often and with such appalling rapidity prove fatal. For in every such case, without exception, of which we have cognisance of the history, we find that the injurious effects of a bile, altered in its normal action through the agency of climatic or weather influences, has been more or less seriously or even fatally aggravated by errors in diet and errors in self-management; by errors such as, in the case of the administration of a drastic purge in the course of medical practice, would be naturally considered as fraught with the most perilous consequences.

In advancing this view of the causes and nature of cholera I claim no new discovery. But I do claim consideration for the facts of physiology and the facts of experience in relation thereto—facts which we find received a fuller attention in bygone centuries than they do receive in the present age, as is evidenced by the name the ancients gave to the disease—cholera, "bile flux." And this flux I hold produces, or at least aggravates, the catarrh of the bowels, which is the most common feature of the disease.

Further, we find, from the records met with in the literature of the subject, that the true nature of cholera, as I conceive it to be, was better understood in this country by our medical officers of the first quarter of this century than it appears to be by those of the present day; for in those early years of our empire in India the cholera disease, which so often and so fatally harassed our troops, and occasionally so seriously hampered the movements of our armies in the field, was almost unanimously attributed to the effects of exposure to weather influences, under very trying circumstances in respect to food, shelter, privations, and fatigues. But apart from all this—although my inquiry is limited to the history of cholera in India during the last few years only—I may here note incidentally that the evidence afforded by the statistics I have produced in the preceding pages of this history tends to prove conclusively, coupled with the notices of the prevalence of the disease in India in ancient times met with in the works of native authors, that the prevalence of cholera has been from the earliest times a periodical and seasonal phenomenon in this country. Further, I may note that this prevalence of the disease in ancient times was not confined to India. Passing over other European countries, I may note that the disease was far more common in England in past centuries than it is at the present day; and that, moreover, until quite recent times it was there always associated with the prevalence of ague or algid fever. At the present day in England cholera is recognised as always present, and as in no way differing from the disease as met with in India, except in the one point of periodical epidemic prevalence—a peculiarity which is due entirely to the difference in the meteorological phenomena characteristic of the two countries, coupled with the difference in the conditions of material prosperity characteristic of the social life of the populations respectively. Yet when the disease prevails epidemically in England it is, without any just cause or reason, distinguished by the term Asiatic cholera, and much time and labour are expended in the profitless endeavour to trace the importation of the disease from an eastern source, forgetful of the fact that the mortality returns prepared by the Registrar-General for England and Wales declare the abiding presence of the disease

in the country itself, quite independently of its occasional appearance among travellers recently arrived, or arriving, from eastern countries. Happily in England, during later generations, cholera has ceased to flourish as was its wont in earlier times. And this change in the deportment of the disease there has been coincident with most marked improvements in the drainage and cultivation of the soil, no less than in the material prosperity of the people and in their general life-conditions, especially in respect to food, clothing, and shelter. But in India, where such advancements in the general improvement of the soil and cultivation on the one hand, and in the material prosperity of its multitudinous populations on the other, whether sanitary, social, or economical, are yet but in the initial stage of what, let us hope, they promise to be in the not very far distant future, cholera is as rife as ever, and manifests its periodical activity with a regularity of recurrence and repetition of phenomena, such as is illustrated by the statistics produced in the preceding pages. When the soil of India is drained as well as is that of England, and when its millions, steeped in the depths of poverty and necessitous want, emerge from their present state of misery and degradation into a state of prosperity approaching that enjoyed by the populations of European nations, then, and not till then, may we hope for any sensible diminution in the prevalence of cholera among its teeming millions. In the subjoined tabular statement is shown the prevalence of cholera in England and Wales during the twenty years from 1860 to 1879 inclusive, in contrast with other allied diseases (in respect to their producing causes), namely, diarrhœa, influenza, and malarious fever (intermittent or ague), and also smallpox. The figures are taken from the Registrar-General's Annual Reports, and the ratios have been reduced to per mille of the population instead of per million.

*Deaths Registered from Smallpox, Cholera, Ague, Diarrhœa, and Influenza in England and Wales, together with the Death-Rates per Mille of Population, in each of the Twenty Years ending in 1879.**

Years.	Smallpox Death-Rate per 1000.	Smallpox.	Cholera Death-Rate per 1000.	Cholera.	Ague Death-Rate per 1000.	Ague.	Diarrhœa Death-Rate per 1000.	Diarrhœa.	Influenza Death-rate per 1000.	Influenza.
1860	0·12	2,749	0·01	327	0·01	203	0·60	9,702	0·05	1,130
1861	0·05	1,320	0·04	837	0·01	149	1·07	18,746	0·03	746
1862	0·07	1,628	0·02	511	0·01	150	1·01	11,112	0·04	915
1863	0·27	5,964	0·04	807	0·01	141	0·97	14,943	0·04	919
1864	0·37	7,684	0·05	934	0·01	112	0·80	16,432	0·04	804
1865	0·31	6,411	0·06	1,291	0·01	117	1·13	23,531	0·03	596
1866	0·14	3,029	0·68	14,378	0·01	135	0·81	17,170	0·03	651
1867	0·12	2,513	0·04	922	0·01	121	0·94	19,851	0·03	607
1868	0·10	2,052	0·07	1,498	...	94	1·39	29,821	0·01	306
1869	0·07	1,565	0·03	702	0·01	114	0·92	19,903	0·03	703
1870	0·12	2,620	0·05	1,065	0·01	120	1·14	25,311	0·03	615
1871	1·02	23,126	0·04	866	0·01	131	1·07	24,140	0·02	348
1872	0·83	19,094	0·04	801	...	84	0·97	22,219	0·01	278
1873	0·10	2,364	0·03	749	...	100	0·94	21,795	0·01	266
1874	0·09	2,162	0·03	596	...	114	0·90	21,204	0·01	245
1875	0·04	950	0·02	550	...	115	1·01	23,982	0·02	449
1876	0·10	2,408	0·03	598	...	95	0·90	21,781	0·01	203
1877	0·17	4,278	0·01	309	0·01	127	0·60	14,703	0·01	205
1878	0·07	1,856	0·03	629	0·01	119	0·99	24,462	0·01	195
1879	0·02	536	0·01	209	0·01	135	0·44	10,948	0·01	266

* From Forty-Second Annual Report of the Registrar-General of Births, Deaths, and Marriages in England for the year 1879.

So far as regards cholera, these figures show a very persistent prevalence of the disease in England, and there is no doubt that were the statistics of other European countries searched a like persistence of prevalence in them also would be apparent. Further, there is good reason to believe that were the cholera statistics of England and the other European countries tabulated month by month, as have been those for the disease in India, a like or corresponding seasonal rise and fall in the prevalence of its fatality would be clearly established. But all this apart, the mere recorded evidence of the yearly prevalence of the disease in England alone stands forward as a striking proof of stultification in the quarantine regulations enforced against the importation of cholera from India and other eastern countries into Europe. As it is, the returns show that the ordinary prevalence of cholera in England is, judged by the death-rates of each year of the series we have given, quite as severe as the prevalence of the disease in India in non-epidemic years. The more regular and more frequent recurrence of the epidemic manifestations of the disease in India is, as has been already suggested in a previous passage, merely the result of the more regular and more frequent recurrence of meteorological phenomena favourable, with other concurrently aiding circumstances, to the greater and more extended development of the disease.

Now cholera is cholera; and if the disease be contagious, as the advocates of quarantine precautions assert that it is, then the cholera of England or any other European country is just as much to be dreaded as—nay, very much more so, by reason of its propinquity—than that supposed to be capable of importation from the far East. But, as a matter of fact, we have no evidence of a conclusive kind that cholera spreads by contagion. On the contrary, the tendency of all the evidence furnished by the deportment of the disease in India—of which there are multitudinous instances adduced in the pages of the preceding history—is most clearly to negative this idea, and as clearly to establish the fact that cholera does not *spread* at all in the manner expressed by the proper meaning of that word, but that it *prevails*—and that too in a very independent and unconnected manner, so far as concerns the general prevalence of the disease over any given area or region. Also, that this prevalence shows no signs whatever of its dependence upon any property of contagion for the means of its appearance in different places and among different communities; but, on the contrary, it shows many signs—as is very abundantly illustrated in the pages of this history referred to—conclusively establishing the fact that cholera does not spread with the spread of man's communications and movements.

Were cholera really endowed with contagious properties, and were it really capable of being carried about and spread by man, we could not fail to have been overwhelmed with numberless instances of its importation from one part of the country to another by our railways, steamers, and other means of rapid locomotion in the present day. But what is our experience on this point? Why, that we have not found a single instance recorded during the past twenty years proving that cholera has been imported from one area or region in which the disease was naturally present into another region or area in which the disease was not also naturally present, and with the result of there causing an outbreak of the disease; whilst, on the other hand, endless instances—nay, the experience of every-day life in this country—prove that cholera cannot be carried by man, go he at railway speed or at footpace, from an area in which the disease is prevalent into another area in

which it has not yet made its appearance in the natural course of its seasonal development, or into an area in which it is not naturally due at all.

To take an instance at the doors of the Punjab Province. What is more common than to find cholera epidemically prevalent during the early months of the year in Bengal and in the North-Western Provinces, and yet not a case more in the Punjab than the normal sporadic manifestations of the disease until months later, when the season for its epidemic prevalence arrives in its natural course. Nevertheless there is continuous daily railway communication between all three provinces. But a more striking instance is afforded in the Punjab itself, where Mooltan (in direct railway intercourse with Lahore and Delhi, &c.) habitually escapes cholera, although the disease be raging at Lahore and be widely prevalent in the northern districts of the province through which the line to Delhi runs, and although even cases of the disease be imported into the city from Lahore and die there. The true explanation of this notable exemption of Mooltan is the fact that the locality lies beyond the range of the meteorological influences which favour the development of cholera, and is rarely, if ever, visited by the disease, except in seasons when the weather influences producing cholera extend so far south as its position lies.

Indeed, the whole tendency of our statistics is to show most clearly that the phenomena of cholera prevalence are dependent upon those of weather prevalence, coupled with the general standard of the public health, as that standard is affected by the prices of food. When there is absolute drought, there is, as a rule, little or no epidemic cholera; when drought is succeeded by the withheld rainfall, then cholera starts outs of its state of quiescence into activity. In other words, when the conditions of weather and soil are such as to reduce to a minimum the evaporation of moisture from the soil, with its accompanying changes of temperature and humidity in the air, then the activity of cholera is also at a minimum. But when the conditions of weather and soil are such as to raise to a maximum of intensity the evaporation of moisture from the surface of the soil, with its accompanying sudden alternations of temperature and humidity in the air, then the prevalence of cholera activity also acquires a maximum of intensity. The activity of the evaporation of moisture from the surface of the soil depends in the first place upon the temperature of the air, and in the next upon the amount of the moisture in the soil—an excessive amount of moisture to the extent of submerging the soil under water being prohibitory of free evaporation. Hence the greater activity of cholera in Bengal and similar moist-soil tropical countries during the autumn and winter months, and its almost entire abeyance during these seasons in the dry-soil extra-tropical Punjab and Central India.

It is the operation of these facts which explains the appearance of cholera in different seasons in different parts of India, and its prevalence during the same season in some parts of the country, and its abeyance in others, as has been explained in the earlier pages of this summary review. For instance, the normal winter cold of Northern India is unfavourable to the free or rapid evaporation of moisture from the surface soil in that portion of the continent, and accordingly there is there no regular prevalence of cholera in the winter season. On the other hand, the normal winter heat of Southern India is favourable to the free and rapid evaporation of its surface-soil moisture, and accordingly we there find regular manifestations of cholera activity during the winter months. But, as has been stated in an earlier passage, the mere evaporation of soil moisture is not of

itself sufficient to produce the phenomena of epidemic cholera prevalence. These phenomena depend also for their manifestation upon other phenomena—phenomena of meteorology connected with the rain-current monsoon seasons peculiar to this country, as has been explained in previous passages. Moreover, under all circumstances of season and region, the activity of cholera prevalence—originally excited by weather influences—is very greatly affected by the life-conditions of the people among whom the disease may manifest itself, more especially in respect to their general health standard as influenced by the food-supply, and the movements of large numbers exposed to weather vicissitudes, as in pilgrimages and other journeyings. In other words, the disease, excited into activity by weather influences, is greatly aggravated in the intensity of that activity by all conditions and circumstances which tend to still further overtax the functional powers of the body, already overtaxed by the naturally occurring vicissitudes of weather; as, for instance, by the concurrent prevalence of famine distress, or by the privations, exposures, and fatigues inseparable from pilgrimages and other journeyings in this country. It is owing to these collateral circumstances and intercurrent accidents that the cholera disease, excited into activity by weather influences, is so often and so seriously increased in the extent of its prevalence and aggravated in the degree of its severity, and not by any property of contagion which the disease may possess.

In respect to this contested question of the contagious properties of the cholera disease, we have, as before stated, found no evidence to prove that the disease is spread or prevails by contagion, but, on the contrary, much evidence to prove that cholera appears and prevails quite independently of any contagious property it may possess. Still, at the same time, I freely admit—not from any personal knowledge or experience of the fact myself, but from recorded evidence of such fact—that cholera may, under certain circumstances, be "catching" as influenza is so, and may be communicable from one individual to another by means of undue overcrowding of the affected and free together, or by means of close and prolonged contact, as is sometimes observed to be the case in ordinary intermittent fever or ague, when an individual suffering from the disease is held to communicate it to another in quite a different, and may be distant, locality where ague was unknown, by intimate contact and sleeping together. It is possible, also, that cholera may be communicated by means of the cholera discharges from the bodies of cholera patients, apparently much in the same manner as ophthalmia, or gonorrhœa, &c., are capable of communication from one individual to another; but it appears that the cholera virus is of an extremely evanescent nature, and in no instance has it been shown that such communicability is in any way connected with, or in any way affects, the ordinary prevalence of cholera in its regular seasonal manifestations of activity.

However, notwithstanding all these drawbacks, considering cholera as cholera or bile flux, that is, as a disease caused by the flow of a deleteriously altered bile, which, under aiding conditions of meteorological influences, produces or intensifies an already produced catarrh of the intestinal mucous membrane, we may proceed to the consideration of the measures of practical treatment which I consider are, under the existing circumstances, best suited to the prevention of its occurrence, or to the mitigation of its effects when it has occurred.

As will have been gathered from the tenor of my argument on the preceding pages, I, like my predecessors of the early part of the century in this

country, view cholera in the light of a disease dependent entirely for its development and epidemic prevalence upon seasonal recurrences of meteorological influences. Further, I believe that the tendency of these weather influences is to produce in the mucous membrane of the alimentary canal a state of catarrh or irritability precisely analogous to the state of catarrh or irritability commonly produced by the action of weather influences upon the mucous membrane of the respiratory passages. In both cases, under ordinary circumstances, this state of catarrh is generally of a mild or transient nature, readily resolving in cure with ordinary care; but in epidemic seasons, more especially if, as is too often generally the case, such ailments be treated with neglect, they are apt to assume graver forms and rapidly to run on to a fatal issue. But my views upon this point are formed from evidences of an extended and repeated kind, such as our predecessors referred to could have had no notion. And taking these points of evidence as the basis of our practical action to the end of preventing or mitigating the prevalence of the disease, I would divide the work into two entirely separate branches. First, that of prevention; second, that of cure. In other words, to measures of prophylaxis or sanitary precaution, and of medical relief or therapeutics, respectively.

To the first division belong all the multifarious details connected with conservancy, ventilation, space, diet, clothing, shelter, occupation, and habits.

To the second division belong the intricate and, to a great extent as at present practised, empirical details of medical treatment.

With regard to the measures of sanitary precaution against the occurrence of cholera among the troops and jail populations, as well as amongst the general civil population of our towns and villages, I consider that, in order to secure a greater amount of success than has hitherto attended the efforts made in this direction, it is necessary to devote a more particular attention to the requirements for the protection of the individual against the vicissitudes of weather than has yet been given to the subject in the various schemes and measures which have been adopted with the view to the prevention of the occurrence of the disease among our troops and prison populations, no less than amongst the populations of our towns and villages.

Whilst fully admitting, and indeed insisting upon, the advantages of an efficient conservancy system in all its details relating to the removal of filth, drainage of the soil, protection of the water-supply, and purification of the breathing air, I am constrained to assert, from the results of hard experience, that all these measures, however beneficial and advisable on their own merits, are of themselves utterly insufficient to secure the individual from the assaults of cholera, unless at the same time they be accompanied by other precautionary measures directed towards the protection of the individual from the vicissitudes of weather which are the invariable attendants of epidemic cholera prevalence. The records of the incidence of the disease in individual cases, as is abundantly illustrated in the pages of the preceding history, show conclusively that, with very rare exceptions indeed, the subjects of cholera have always been exposed, immediately antecedent to an attack of the disease, to the influences of weather whilst in a more or less completely unprotected state against their effects upon the functional operations of the body.

The unprotected state referred to implies want of support to the system, in times of the epidemic prevalence of cholera, by long fastings, by insufficient or unwholesome food, by protracted fatigues or exhausting exercises; the want of protection to the body by insufficient or faulty clothing, the want of proper shelter to the body, and most especially so at night when the

body is in a state of passive repose, by either sleeping in the open air or indoors under circumstances of either over-ventilation or faulty ventilation, in consequence of which the individual is exposed, most commonly in a state of undress, to the full effects of the night air, or, worse still, to draughts of it playing over the body whilst in this unprotected and passive state; and lastly, by want of proper self-management in all that relates to eating and drinking, habits and amusements.

To understand the nature of the injurious effects upon the system liable to be produced by exposure to weather influences—at times of the epidemic prevalence of cholera—whilst in such unprotected states of the body, we must bear in mind what has been very briefly mentioned in respect to the functional derangements of the system commonly resulting from the effects of weather vicissitudes in ordinary times; and at the same time we must also bear in mind the nature of the weather changes which usually characterise periods of epidemic cholera prevalence, viz., more or less hot day temperature and humidity, followed by more or less cold night temperature and moisture, with almost always an unusually stagnant atmosphere, or an atmosphere moved only by gentle, but at the same time most injurious in their action upon the functional services of the body, currents or draughts.

In our jails and European barracks, there is no doubt, the systems of ventilation in force are very faulty; and I believe that the generally observed greater mortality from cholera (to make no mention of other diseases due to the effects of exposure to weather vicissitudes) among our jail populations and European troops than among the Native troops, who live in more sheltered quarters in respect to the access of night air, is very largely attributable to the excess of ventilation by which at night they are exposed—under other unfavourable conditions as to the protection of the body also—to the effects of a damp cold air in its most injurious form, viz., that of draughts.

I consider, therefore, that one of the most important of the measures of sanitary precaution for the prevention of cholera which demands our earliest and most careful attention is the provision of some means for more efficiently protecting our European troops and prison populations from exposure to the effects of night air in their sleeping-barracks, especially during periods of epidemic cholera prevalence. This object may be attained by adapting the present systems of ventilation in force in these buildings to the requirements of the case by the provision of folding-doors to be closed at night, and by the provision of freer roof-ventilation, aided by air-holes in the side walls above the doorways. At the same time, I consider that at such times—of epidemic cholera prevalence—warm clothing, such as woollen shirts and drawers, should be worn at night-time, and that during sleep the body, most especially the trunk from the hips to the armpits, should be covered by a good blanket; and in quarters or barracks which are themselves in a damp state, or which are in the immediate vicinity of a damp plot of land, I consider that the use of fires between sunset and sunrise is highly to be recommended as a means of maintaining an equable and comparatively dry temperature.

At times of cholera prevalence the observance of these protective measures I consider to be a matter of the first importance; for I am convinced, from the teachings of a long and extensive experience, that all other measures of sanitary precaution will, as they have in the past, prove ineffectual as preventives of cholera so long as the protective measures above indicated are neglected.

Next in importance to the protective measures of proper ventilation and proper clothing and proper warming above mentioned, I consider, come the

protective measures requisite in regard to diet. In times of cholera prevalence, owing to the naturally depressing effects of the seasonal influences upon the body generally, the appetite and digestion become more or less commonly and seriously impaired, and give rise to unusual cravings for stimulants and other than the ordinary articles of food. The careless indulgence in these is always attended by perilous risk, and has so constantly led to serious consequences that there is scarcely an article of ordinary food which has not in its turn been denounced as the direct cause in precipitating the attack of cholera following upon its consumption. The fault, however, lies, at least in the vast majority of cases, not entirely upon the quality of the food alone, but also to a great extent upon the condition of the stomach into which it is introduced; and both being at fault, the consequences of their mutual contact are usually more serious than when only the one is at fault. Articles of food which in ordinary seasons are received by the stomach complacently and disposed of comfortably are in times of cholera prevalence found to be irritating and even poisonous in their effects, thus indicating default in powers of the stomach as the primary cause of the mischief. This impairment in the digestive powers of the stomach is, I consider, due to over-excitation of the functional actions of the skin and lungs (as a result of the prevailing high temperature), being compensated by a reduced activity in those of the liver; and also, in a measure, to the enervating effects of the weather itself, which is habitually observed to be at such seasons of a more or less oppressive character. With the alternations of day and night temperature this impairment of the digestive functions is observed to rise and fall with more or less of regularity; but the impairment is present, in more or less pronounced degree, all through the persistence of the epidemic seasons, to the direct influences of which it owes its origin, and indeed its subsequent aggravations also. For it is almost always some sudden check (through the action of chill) to the previously over-excited action of the skin and lungs which throws back upon the liver and other internal excretory organs not only their normal amount of work, but that also of the external excretory organs whose functional activity has been thus suddenly checked, or, may be, been temporarily stopped altogether, in respect at least to their eliminating duties, and with the result of a more or less serious upset in the harmony of their relations. Impaired digestion, then, whether seriously incommoding or the reverse, we may consider to be a common and general concomitant of seasons of epidemic cholera. And this impaired digestion we are justified, from the evidence before us, in considering to be a very common and general predisposing cause of cholera incidence; and more especially when, as is usually the case, it happens to be associated with the catarrhal state of the bowels produced by the effects of the prevailing weather influences. The aggravation, on a large scale, of these unhealthy conditions of the digestive organs and alimentary canal we see illustrated in seasons of famine distress, which may happen to be coincident with periods of epidemic cholera; on a lesser scale, in seasons of pilgrim assemblages and journeyings, or in the marching of troops in the field, or in the daily wanderings and labourings of the poorest classes in our large towns and cities; and, on a lesser scale still, in the management of our troops and prison populations. In each and all the aggravation of an impaired digestion and unhealthy condition of the alimentary canal, produced by the effects on the system of naturally recurring weather influences, is brought about by neglect—whether helpless or careless—of the precautions rendered necessary by the established circumstances of the occasion.

As regards the famine-struck, the pilgrim devotees, and other poor

wanderers in search of their daily bread, there is little hope, under the existing conditions of life in this country, of seeing any sensible alleviation in their liability to the incidence of cholera. But as regards the troops and prison populations, and other classes more immediately under Government control, I believe that a great deal may be, and must be, done in order to mitigate their liability to the incidence of cholera when the disease is abroad in epidemic form. And this apart altogether from the general sanitary precautions of a preventive nature already alluded to. Stress has been laid upon the impairment of digestion, which is a constant accompaniment of seasons of cholera prevalence, because it is, I consider, the first stage in the general deterioration of health which at such times predisposes to an attack of the disease. And so convinced am I of the great importance of this premonitory sign, that I would unhesitatingly give it the first place in our consideration of any measures of a preventive kind, against the effects of cholera-producing influences, which are directed towards the protection of the individual, so far as concerns himself. The impairment of digestion, which is observed to be so common and so constant an accompaniment of seasons of cholera prevalence, is due, as I have indicated, to the affects of weather influences upon the functional operations of the system, and is of course produced in very different degrees of severity according to the individual idiosyncrasy and health standard, and is aggravated or otherwise according to the efficiency or inefficiency of the protection enjoyed by the individual against the operation of these weather influences, and more especially if the mere state of indigestion be accompanied also, as is very frequently the case in epidemic seasons, by a state of catarrh of the bowels.

I have already referred to the precautionary measures of protection which I consider requisite to ensure the individual against the effects of weather vicissitudes during seasons of cholera prevalence; and it now remains for us to consider the precautionary measures which are requisite to ensure the protection of the individual against aggravation of the deteriorated standard of health which prevails at seasons of epidemic cholera, as a consequence of the impairment of digestion naturally produced by the effects of those seasonal influences. As has been already stated, owing to the natural impairment of digestion in cholera seasons, almost every article of ordinary diet is at times apt to disagree with the stomach, and to produce an aggravation of symptoms predisposing to the supervention of cholera—the graver form of the disease so called, as defined in earlier passages; and this in consequence of a primary fault in the ordinary powers of the stomach itself, and more especially if this state of indigestion be accompanied also by that of catarrh of the alimentary canal. It is to this primary fault, then, that we must devote our attention. I have stated my belief that it is due partly to the enervating and depressing effects of the prevailing weather, and partly also to derangement in the normal balance of the excretory functions, and especially of the skin and lungs in their relation to those of the liver. And I now state my belief, that the means best calculated to remedy this impairment of digestion is the observance of a carefully regulated diet, aided by the use medicinally of general tonics and other appropriate remedies. I consider that during seasons of cholera prevalence too much care cannot be devoted to the maintenance in the individual of a sound digestion and good appetite, and these I conceive can be secured by a light farinaceous diet, with milk and eggs as the main constituents, far more certainly than by a coarse meat diet with indifferently cooked vegetables. I have no intention of advocating a strictly vegetarian

diet, which I consider would be an extreme and injudicious innovation. But I do most strongly advocate, during the seasons in question most especially, a diet more suited to the occasion than that which is at present adopted, more particularly among our European troops. Without any notion of excluding meat—animal flesh—from the diet scale, I consider that in times of cholera prevalence its consumption may be with great advantage largely diminished in preference for articles of a lighter and more easily digestible nature. The consumption of raw vegetables and unripe fruit, particularly melons, cucumbers, newly harvested rice or maize, &c.—particularly the consumption of raw maize cobs and fruits of various kinds whose natural quality is to act on the bowels as a laxative—at such seasons should be eschewed as dangerous poisons. It is out of my power to lay down any general rule of diet suitable to all constitutions and all circumstances. The main object to be attained is the maintenance of sound digestion, and this is best worked for by the avoidance of all articles of food known to be deleterious, at such seasons especially, or found to be so by individual experience. For the rest, the natural powers of the body may at such seasons be materially aided and benefited by the use of some medicinal tonic, such as the bitter vegetable tonics in the form of infusion; and the adoption of a course of such tonics on the approach, and during the endurance, of a cholera epidemic I would strongly recommend, for the European troops and prison populations especially, together with the use of other remedial agents such as may suggest themselves to the medical practitioner.

It has often been noticed that during the seasons of cholera prevalence the alternations of day and night temperature are more keenly perceptible to the senses and bodily feelings than in ordinary times or seasons; and I believe that much benefit may be derived in the way of fortifying the system against the effects of the night-chills at such seasons by the use of some hot nourishing drink, such as soup or gruel or tea—the former at all times, the next for those prepared to sleep, the latter for those about to watch. Among the poorer classes in our cities and towns the use of these hot drinks as an ordinary beverage is not only comforting and nourishing, but would also tend to divert the people from the use of cold water of more or less impure quality; for it is a commonly observed fact that in times of epidemic cholera, or of epidemic malarious fever, ague more especially, a draught of cold water, whether pure or impure, has very often precipitated an attack of either disease in those predisposed to such forms of ailment, merely from the shock thus conveyed to the system already more or less chilled or depressed by the effects of the prevailing weather influences, or by direct shock to the mucous membranes already in an irritable state from impaired functional health or from the existence of a catarrhal state. Such, in brief terms, are the principal of the measures of sanitary precaution, with the view to the prevention of cholera, which I consider require careful observance, in addition to the measures already usually adopted with the same object.

During recent years much reliance and much weight have been put upon early removal or flight from a locality visited by cholera as the surest and best means of escaping the disease. And there is, no doubt, much advantage to be derived from such a course, although our experience in its adoption amongst our troops and jail populations has not always been attended with uniform success, or even, I will say, with a success commensurate with the efforts made, the discomforts endured, the risks run, and the expense incurred. I have not been able to tabulate statistics to show the

amount of mortality, sickness, and discomfort, not only from cholera, but from sunstroke, fever, and other maladies, attending the removal of troops and prisoners into camp on the appearance among them of cholera; but there is no doubt, from the recorded facts regarding the incidence of the disease among them whilst in camp, that that incidence has been very much greater than was at all contemplated or anticipated as a result of such movement from the locality originally affected. It is no argument in favour of the measure to adduce the fact that, after a certain number of moves from site to site in camp, or that after the first move, when, as is almost always in such instances the case, that move was made late in the course of the outbreak, the change from the locality originally affected has been followed by a cessation of the activity of the disease; because it is a well-known and commonly observed peculiarity in the deportment of cholera—always understanding by the term the train of special symptoms defined in an earlier part of this review—to appear suddenly, endure for a while, and then rapidly to subside or to suddenly cease entirely among any particular community visited by the disease. Nevertheless there is no doubt that a change of site or removal from a locality affected by cholera activity is, if judiciously carried out, of the very highest advantage. But the advantage depends entirely upon the judiciousness of the change or removal. With a due observance of the sanitary measures of precaution which I have suggested with the view to the prevention of the incidence of cholera among our troops and jail populations—namely, a more efficient protection than at present is afforded against weather vicissitudes, and a more careful attention to the health standard as affected by those weather vicissitudes—I entertain the hope that the necessity for removals into camp, on a wholesale scale at least, will to a great extent be obviated altogether. At the same time, I am by no means sanguine that such changes or removals can be altogether dispensed with, inasmuch as a change of climate, under the circumstances engaging our attention in this connection, is always highly advantageous. But in order to derive the greatest advantage attainable from such change, the change should be made judiciously, and as part of a prearranged system anticipatory of the incidence of the disease. For this purpose, so far as concerns our troops and jail populations, I would select certain sites in every division of each province which may be noted for their general freedom from the incidence of cholera—and these sites are indicated by the statistical records of cholera during the past twenty years which I have given in the preceding history for each district in the several provinces of India—and on them establish permanent sheds or shelter-barracks for use as occasion may necessitate, and at the same time mark out sites available for camps in their close vicinity.

To these shelter-barracks or temporary camps I would send, on the approach of cholera to the district or its appearance in the vicinity, of the troops more especially, all those found subject to dyspepsia or diarrhœa, and keep them there till the disease had disappeared from the station to which they belonged. In the selection of those to be sent to these cholera refuges or camps much will depend upon the medical authorities and the advice they give; but if once they are unanimous in the view they take of the nature of cholera there will be no difficulty on this point. And after what I have advanced in regard to the nature and causes of cholera and the measures of precaution best suited to the prevention of its occurrence, I, for my own part, can see no reasonable objection to the simple means proposed being given a fair trial.

I now come to the consideration of the second branch of our practical action before alluded to, viz., that to the end of mitigating the prevalence of cholera after it has once made its appearance; in other words, to the medical treatment of the disease. Here I can deal with this subject only in the briefest terms; but I hope, if spared to do so, to consider it more in detail in a short practical treatise on the causes, nature, and treatment of cholera, which I purpose publishing as a sequel to this work.

There is no disease in the long list of medical nosology which has been treated by the profession with greater empiricism than that commonly known by the term cholera, the commonly accepted definition of which I have already given in earlier passages of this work. And this diversity and contrariety of practice is the mere natural result of the want of agreement as to the nature and causes of the disease, no less than of the want of appreciation of its true character under the different stages of development and the varied forms of severity in which it presents itself to our notice, in epidemic seasons more especially. In practice it is the habitual rule to ignore the disease in its earlier and usually triflingly mild stages, and to recognise it as cholera only when it presents the symptoms of the gravest and most perilous stage of the disease; and it is this custom which has endowed the disease with a mystery, a dread, and a fatality which it really does not possess. Were it the practice to habitually ignore the ordinary and milder forms of "cold," or catarrh of the respiratory passages, and recognise the true nature of the affection only when it had advanced to the stage of diffuse bronchitis or of pulmonary catarrh (pleuro-pneumonia), as the case may be, we should endow that disease with just as fictitious a mystery, as panic a dread, and as unreal a fatality as we have done in regard to cholera. And indeed, as a matter of fact, this class of pulmonary diseases, as they prevail among the millions of this great country at least, has already acquired characters of mystery, dread, and fatality very akin in all respects to those with which cholera is invested. The cause of this is the same in both cases, namely, the want of proper appreciation of the true nature of the diseases and of the various influences operating to produce their graver and more rapidly fatal forms. A catarrh of the respiratory passages under ordinary circumstances often, and in epidemic seasons very much more so, under neglect or maltreatment on the part of the sufferer, passes on into diffuse bronchitis or pleuro-pneumonia. Similarly, whether through helplessness or carelessness, a catarrh of the alimentary canal, under ordinary circumstances, often, as in cases of the sporadic form of the disease, and in epidemic seasons much more commonly so, under neglect or injudicious conduct of the patient —whether helpless or careless—passes on into active diarrhœa, or into the severer stage of the malady known as cholera. In both forms of catarrh the earlier stages and milder attacks are so little inconvenient to the patient that they are seldom much noticed or cared for, until this neglect causes their aggravation and the development of more serious symptoms. The neglect referred to is more often helpless than careless; nevertheless it is the cause, more especially in epidemic seasons, of the greater incidence of the severer forms of these maladies, as well as of the allied diseases mentioned in earlier passages, viz., malarious fevers. Hence the necessity of a more careful attention to the well-being of the patient in the earlier stages of these several diseases.

We are here concerned only with the discussion of cholera, and I have no hesitation in asserting my belief, that if we are ever to cope successfully with that dreaded disease, it must be by a careful attention to the earliest

signs of its initial stages, and by prompt and judicious treatment as soon as these are detected. The presence of indigestion, or of catarrh of the alimentary canal—in seasons of epidemic cholera most especially—should never be neglected. The appropriate remedies for these ailments are well enough known; but of far greater importance than the mere administration of medicine is the observance of a judicious regimen and wholesome diet, coupled with careful nursing.

As regards regimen, sufficient has already been said of the importance of protecting the body by clothing, shelter, and proper care from the effects of weather influences to indicate the lines of treatment to be pursued in this respect. With regard to diet, also, the main causes of derangement of the digestive functions, especially during seasons of cholera prevalence, have been pointed out in detail sufficient to indicate the general principles of treatment to be adopted in this respect. With regard to nursing, by which is meant ordinary self-management and self-care on the first perceptions of ailment, it is not too much to say that the proper observance of this precaution is of itself sufficient to enable the system to recover itself from the first effects of deranged functional offices in the vast majority of instances, and that a careful attention to its observance in seasons of epidemic sickness is one of the surest means of escaping attack.

As to medicinal treatment, it is impossible to lay down any fixed course applicable to all cases, owing to the varied forms and different degrees of the disease met with when first brought under medical care. In every case it is necessary to be guided in our practice by the symptoms presenting. But in no case of cholera prevalence will it suffice, to meet the necessities of the occasion, merely to distribute cholera-pills or other medicines for general use amongst the affected, and then to await the arrival of cases in the severer stages of the disease, or even in a moribund state, as is too generally the custom at present. If cholera is ever to be combated successfully, it must be by taking the attack in hand in its earlier and comparatively mild stages, and by care and nursing aiding the efforts of nature to restore the body to its usual state of health. The more thoroughly this early treatment of the disease is pursued the more completely will the suffering and mortality from its assaults be diminished to a minimum and the terrors of its assaults be dissipated. I am well aware, however, of the difficulties which interfere to prevent such an early treatment of the disease in the vast majority of the cases of its incidence, more especially among the general population, owing to the slight inconvenience felt by the sufferers in its earlier stages, and the ignorance prevailing as to the true nature and susceptibilities of such slight attacks. But among our troops and jail populations there is no reason for the continuance of such difficulties. Among these classes the disease can be detected in its earliest stages and brought under treatment at once. And, in my opinion, the results of an outbreak of cholera among any body of troops or prisoners may be taken as a test of the skill and foresight of the medical authorities concerned. After all, however, even under circumstances of the most careful attention and all practicable foresight, it is to be expected that some cases of the severer forms of the disease will come for treatment in all epidemic outbreaks. But the object to be aimed at is to reduce the number of such cases to a minimum; and the attainment of this object will be best effected by a very careful and sustained attention, during epidemic seasons, to the health standard of the individual, and the early treatment of the first signs of disorder.

The nature of the treatment will of course vary with that of the

symptoms presenting. Thus in the stage of malaise or dyspepsia tonics, with an occasional aperient of rhubarb and magnesia, combined with romatic spirits of ammonia and tincture of cardamoms, may be found useful aids to a strict regimen and careful diet in restoring the healthy tate; whilst in the advanced stage of bilious diarrhœa more useful remedies are tonics—small doses of quinine dissolved in sulphuric acid and water s a very good form—and astringents, such as sherbets of dilute sulphuric cid. A very popular remedy in this country, and one which has been found very useful in this stage of the disease, are the "cholera-pills" first promiently brought to notice by Surgeon-General John Murray. They consist of pium, assafœtida, and black pepper. By some the pills composed of opium, pecacuanha, and cayenne pepper are preferred. The action of both is lirected to the catarrhal state of the intestinal mucous membrane. But to e of any real benefit these remedies must be combined with careful attenion to regimen and diet. In the severer forms of the disease tending to the upervention of collapse the treatment must be regulated by the symptoms. f the collapse be due to the colliquative discharges from the stomach, owels, and skin, the drain of fluids from the body thus occurring may be hecked by the administration of nitrate of silver, in the form of pills, or in hat of enemata. But if the collapse, as is not infrequently the case, be the onsequence of shock to the system, by check to the functional action of the kin and lungs, without any of the discharges above referred to, then the emedies to be adopted are such as are calculated to restore the normal action of these organs, viz., fresh air, artificial respiration, shampooing, friction of the body, sinapisms, &c., &c., and—not the least important—the lighting of a fire in the vicinity of the patient's bed, and a sufficiency of clothing to retain the bodily warmth.

With these brief remarks I conclude my "Summary Review of Cholera in India, 1862–1881," and in doing so, consider it necessary to state that the subject has necessarily been dealt with in but the most general manner and terms, owing to the want of time and leisure for a more detailed and systematic exposition of the investigation. The statistics and historical records which have been brought together, at one view as it were, in the preceding pages have been produced at the cost of unremitting labour, which, being in excess of my already sufficiently onerous official duties, have occupied the whole of my time, without affording any leisure for the careful study and critical examination of the details, other than the insight acquired, and general impressions produced, during the laborious task of compilation, collaboration, and tabulati of the manifold and multitudinous details dealt with. The result of th l these impressions is set forth in the preceding Summary ld fain believe that they may be relied on as correct, he exposition of the subject and the arrangement of more favourable circumstances of leisure, have ore systematic sequence. As is, however, in India during the twenty ars 1862– irst time, cannot fail to fall and food-supply other epidemic

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Digitized with financial assistance from the
Government of Maharashtra
on 26 June, 2018